17 JUNE 1954 POWER CONVENTION NUMBER NINEPENCE

ELECTRICAL TIMES

B T-H RESEARCH

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Efficient and economical in use.
Benjamin lighting gives maximum 'visual comfort'
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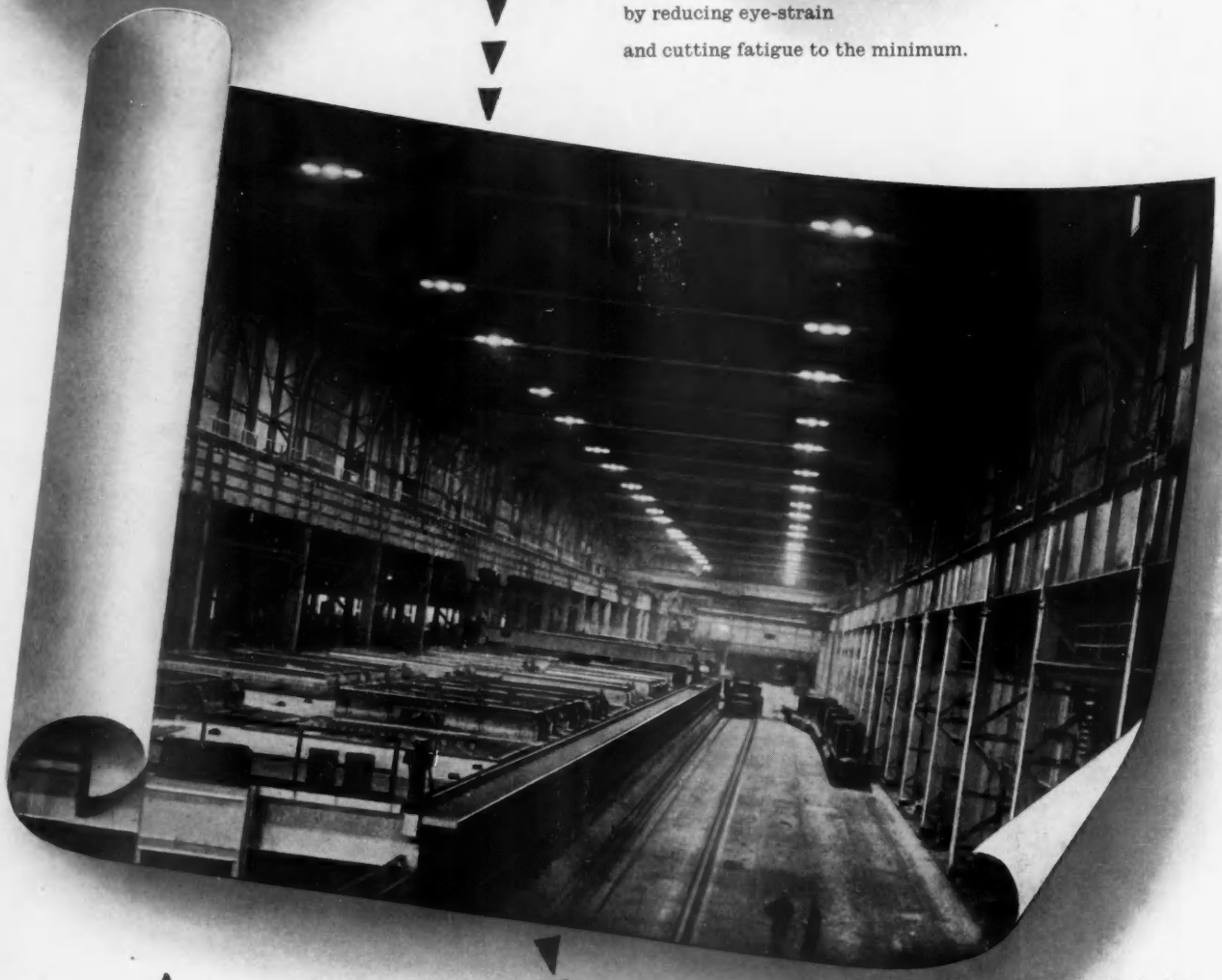

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Avail yourself of the best experience
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an expert survey will be carried out,
every detail studied and
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Power is instantly available because Nife Steel-Alkaline Batteries do not deteriorate even during long periods of inactivity.

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Nife equipment is exceptionally compact and there is no need for a separate battery room.

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NIFE - NEVERFAYLE

the emergency equipment with the steel-alkaline battery

N66 B

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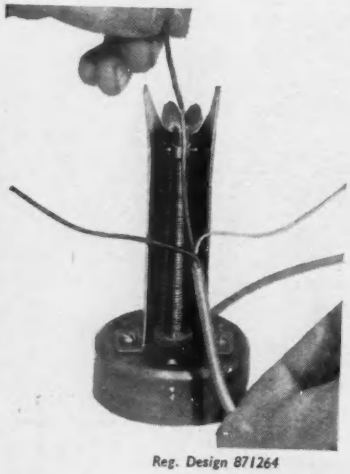
STRIP IT



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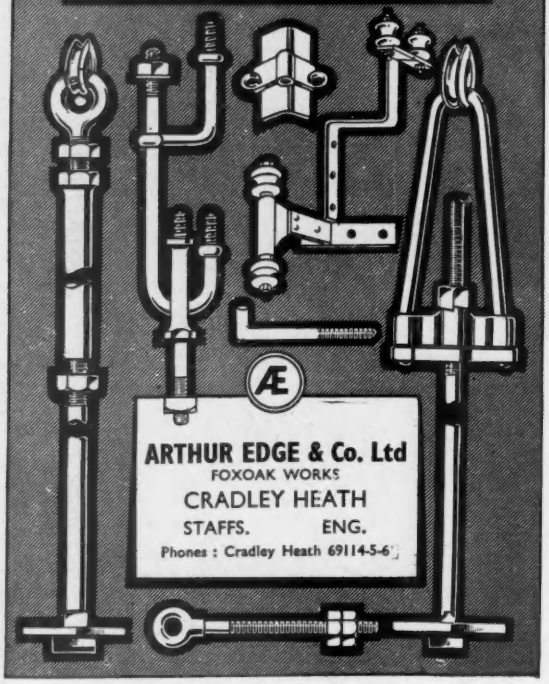

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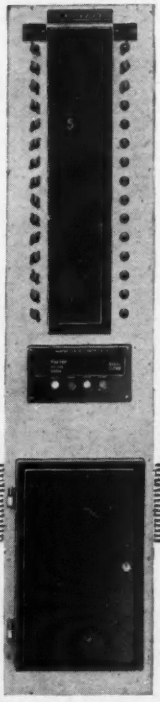
Reliability developed from experience

Long Retracting Type Soot Blower



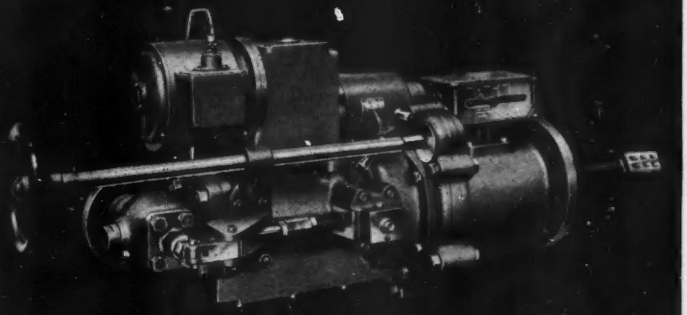
Soot Blower Control Panel

HOPKINSONS'

AUTOMATIC

SEQUENCE-CONTROLLED

SOOT BLOWERS



Retractable Type Soot Blower

The complete range of Hopkinsons' electrically-controlled soot blowing equipment is available for any type of water-tube boiler.

The sequence of operations is automatically controlled from a central panel, with strict regularity and pre-selection in soot blowing routine, visual indication of the operation in progress and independent electrical or hand operation.

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EX9

8ft. fittings mounted 8 times their own length

Interior of the Ferranti Transformer Factory, Hollinwood

With mounting heights of 64 ft. this splendid new transformer factory is equipped throughout with Metrovick 8 ft. twin 125 watt fluorescent lamps and fittings. The 1,800 lamps used give an average illumination of 15 lumens per sq. ft.

Please write for brochure ES4123J21 which gives full details of this and other 8 ft. installations.

METROVICK

8 ft. fluorescent lighting fittings

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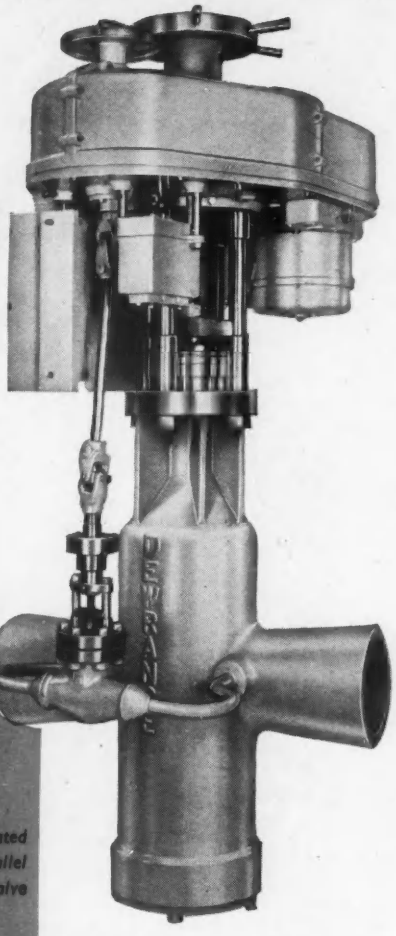
S/P404

An Outstanding Advance in Modern Valve Engineering

DEWRANCE FABRICATED VALVES WITH PRESSURE SEAL



¾" Fabricated Parallel Slide Valve

8" Fabricated Parallel Slide Valve with Pressure Seal Cover.

FOR STEAM PRESSURES UP TO

3,000 lb./sq. in.

TEMPERATURES UP TO

1,100°F

CHARACTERISTIC FEATURES

SITE WELDING
Design permits uniformity in material specification and thickness for both valve and pipes.

PRESSURE SEALING
Conventional heavy cover flanges and bolting entirely eliminated. Joint made with patent fluid metallic packing ring pressure sealed.

ACCESSIBILITY
Access to internal components through pressure sealed cover on underside of valve, no need to dismantle valve operating gear, an important feature when valve is power operated.

TELEPHONE HOP 1244 (10 Lines)

DEWRANCE AND COMPANY LTD.

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WORKS: LONDON, BRADFORD, DUMBARTON, HILLINGTON

Bigger and better deliveries

With the introduction of a new continuous vitreous enamelling plant and extensions to our factory, production is going up rapidly. This picture shows the first of a fleet of articulated vans capable of carrying a load of 50 large cookers from our production line direct to your Stores without damage or delay.

You can't beat a "Belling"

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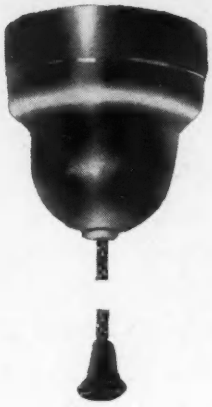
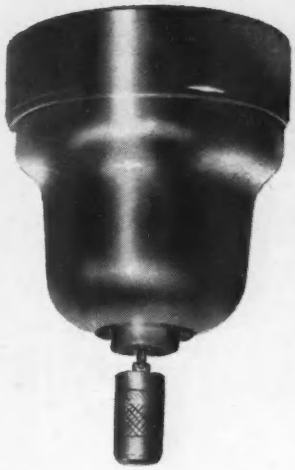
"Look at these



"KNOT"
2" dia. Base

"UNIVERSAL"
2" fixing type



"STANDARD"
2¼" dia. Base

KERSON
ceiling switches

. . . so neat-looking, and they're absolutely safe—see this porcelain base for yourself. You'll be fitting many homes and factories with different Kerson models during your career. Just notice how these switches save money by eliminating extra cable runs to wall switches. Like many other Kerson products, these ceiling switches are used all over the world. In my jacket pocket, there's a catalogue showing all the different Kerson accessories. Write and get a copy.

Good! We're finished—that's something else for you to remember: Kerson ceiling switches are no trouble to fix."

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CORE BALANCE EARTH LEAKAGE PROTECTION

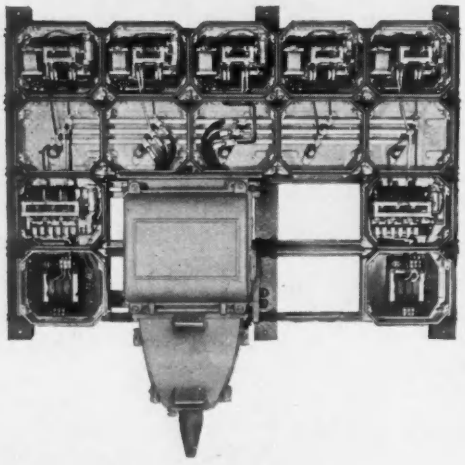
in

IRONCLAD ENCLOSURES

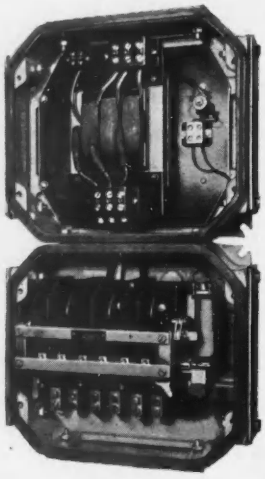
TYPE

I·D·S

INCORPORATING AUTOMATIC CIRCUIT BREAKERS IN EACH OUTGOING WAY



Build up of typical board showing bus-bar dispositions and ease of entry to connections.



A triple pole 30 amp. Circuit Breaker with core balance transformer and E. L. relay.

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(GREAT BRITAIN) LIMITED

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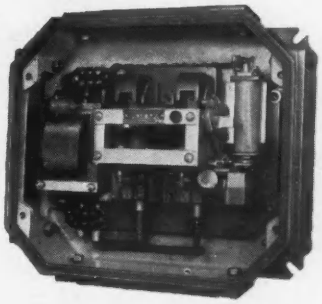
DEVELOPMENT

★ **UNIQUE** for its Core Balance Leakage protection.

★ **UNIQUE** as an Ironclad Distribution Board with automatic protection for normal overloads and short circuits.

★ **UNIQUE** on individual ways of power and lighting circuits with Earth Leakage protection for current ranges of up to 15 amps. and up to 30 amps. on low and medium pressure circuits.

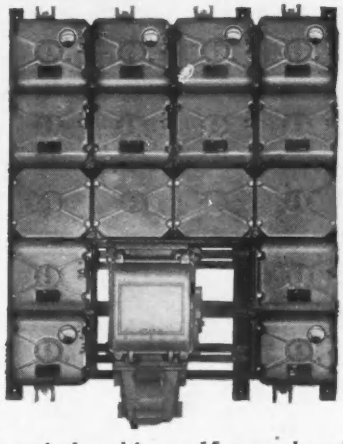


Typical of the 15 amp. triple or double pole enclosure with integral core balance transformer and earth leakage relay.

★ **UNIQUE** for Factory circuit protection with Earth Leakage discrimination of 0·5 and 0·75 amps.

★ **UNIQUE** for application to portable and transportable equipment, for industrial use, mines and quarries, cement works, gas works, shipyards, dock and marshalling yard installations.

Conduit or cable outlets available



A typical multi-way 15 amp. board with instruments.
Individual panel isolators also available.

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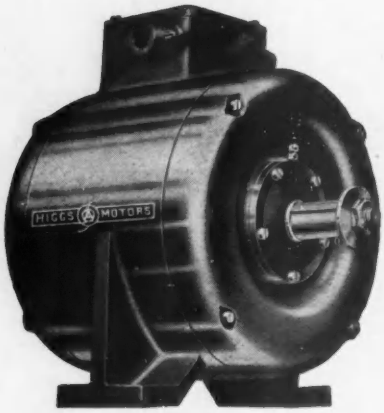

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The high starting performance developed by this range of specialized machines ensures smooth and positive acceleration

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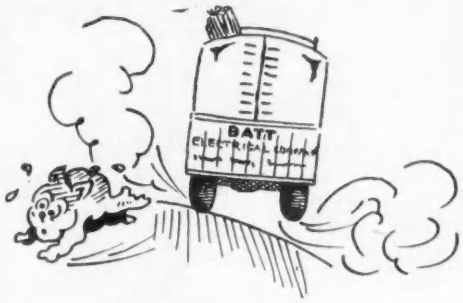

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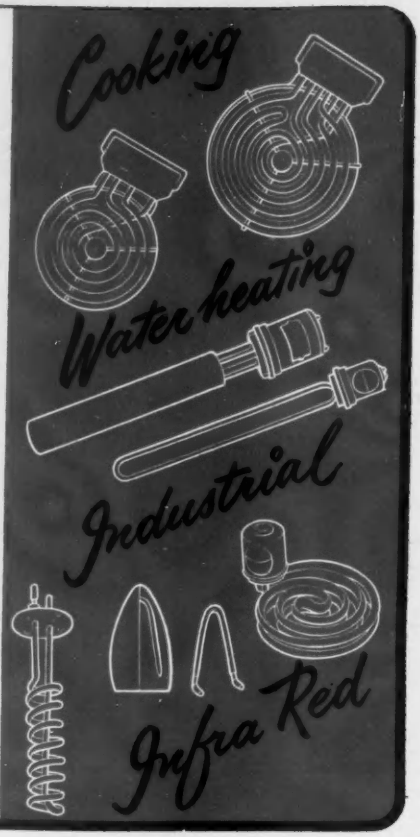
TUBULAR SHEATHED HEATING ELEMENTS

are suitable for the majority of heating problems – here is one of many applications

Single tube 2-circuit 1800 W. Boiling Plate. Made to E.D.A. Specifications, also with flexible lead connections suitable for American type cookers. Provides Radiant Heat throughout or, as illustrated, in the inner turns only.



Our business is solving heating problems — can we help you?

BACKER ELECTRIC COMPANY LIMITED

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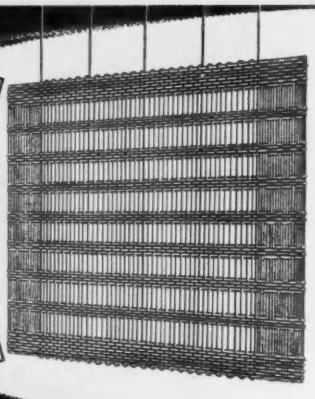
RESISTANCE **GRIDS** and **NETS**

ASBESTOS WOVEN



THE steadily increasing demand for CRESSALL Asbestos Woven Resistance Grids and Nets is proof of their pre-eminence in this type of resistance unit. The nets are light in weight, rigid, and vibration and shockproof, and are made from the most carefully selected materials. We offer a range of standard sizes to meet almost any requirement, for a single resistance unit or a banked assembly. Illustrated catalogue can be supplied on request.

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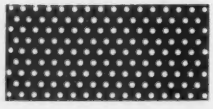
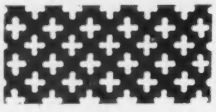
Perforated METALS

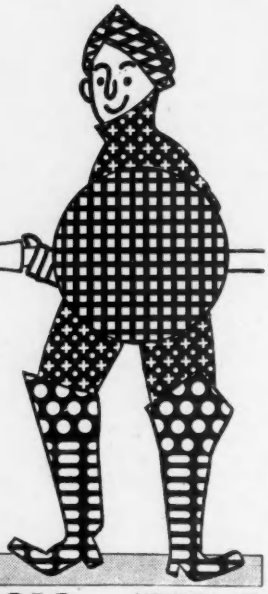
Round, square, club, diamond, rectangular or round ended slot holes available in a wide range of sizes and varying pitch.



LET US ATTACK YOUR PROBLEMS



In Steel, Zinc, Copper, Brass, Aluminium, Monel or Stainless Steel. For ventilating, panelling, cable trays, filters, meat safes, machine guards, acoustic work, etc.



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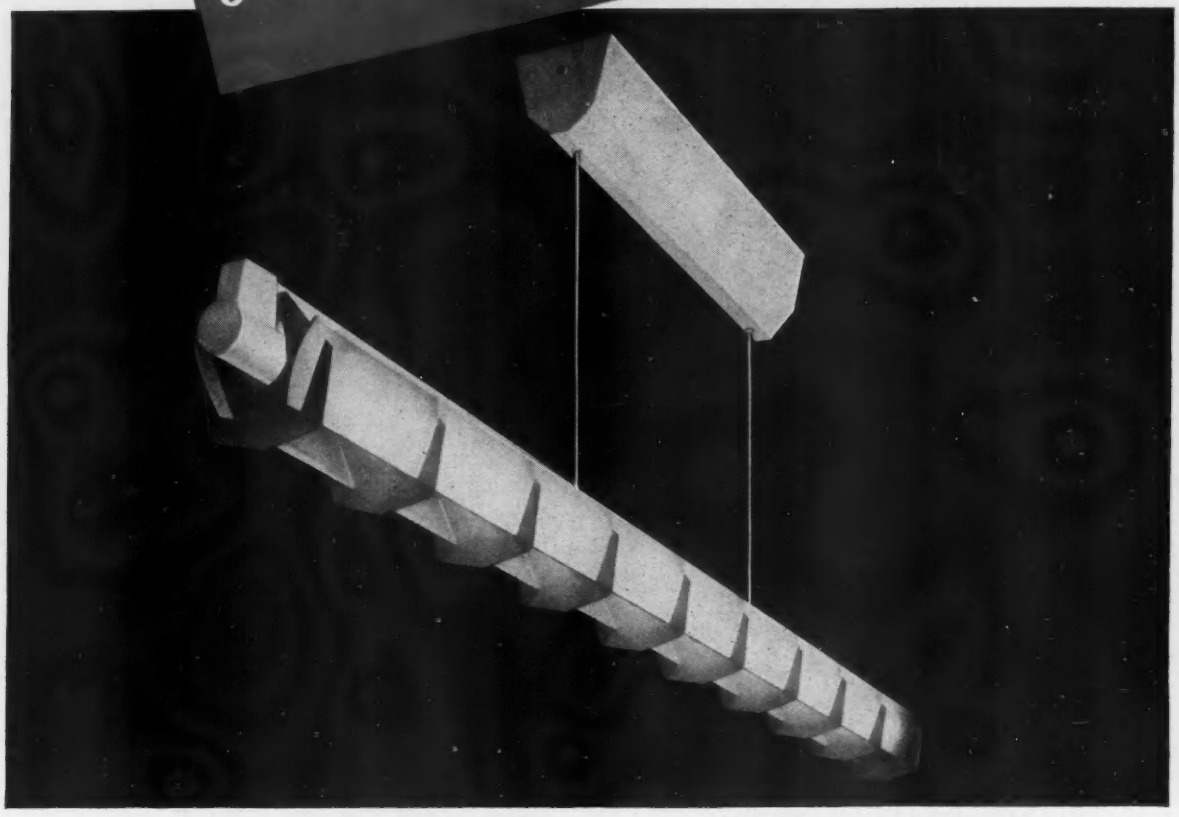

Complete unit comprises a ceiling box containing control gear, thin rod suspension and a spine supporting the fluorescent lamp, coloured transverse metal louvres and diffusing opal perspex side screens

The *NEW* EKCO Fluorescent Fitting

Scientifically designed, pleasing slim appearance, high efficiency, low brightness, light weight.

This single 80w. 5ft. general purpose EKCO fluorescent lamp Pendant fitting has been specially designed by the Building Research Station and developed and manufactured by Ekco-Ensign. It is admirably suitable for a variety of applications and it particularly meets the rigid specifications for school lighting.

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EKCO-ENSIGN ELECTRIC LTD

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The Lady of the House

AND THE BALANCE OF POWER

BRITAIN today has more electricity than she has ever had before. In the past six years, 40 new power stations have been brought into operation and power supply has increased by 50 per cent. At the same time, the demand for electricity is greater than it has ever been.

When the Lady of the House goes about her tasks, using labour-saving devices to lighten her day, she is using electricity. Is she thereby depriving Industry of electricity, and upsetting the national economy? She is not!

If electricity were more widely used by homes, factories, farms, shops, offices and for street lighting — this would keep the generating plant more fully loaded. The demands on the power stations coming from these different classes of consumers would be diversified. That is to say the loads would not occur simultaneously but, in the main, at different times of the day — and continuous full output from the generating plant would reduce the cost of electricity.

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F.9

3 New Components
FOR THE ELECTRONICS INDUSTRY

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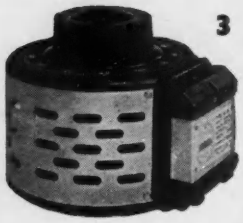
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2

1 **Bercostats.** A new range of power rheostats for industrial electronics. 5 sizes from 25 to 150 watts. All ceramic construction. Windings embedded in vitreous enamel giving great mechanical strength. Finishes comply with RCS.1000. Available in open, protected and ganged models.

2 A range of 3 moulded knobs with collet fitting (Patent applied for) ensuring positive grip of circular shafts. Quickly and easily fixed and removed. Interchangeable collets for ¼", ⅛" and ⅜" shafts.

3 **Berco Rotary Regavolt Variable Transformers.** Two additions to the range of well known "Regavolt" regulating transformers, but of rotary type, for 200/250 volt supplies, ratings 0·8 and 2 amps respectively. Compact, smaller than any other transformer of comparable rating. Suitable for panel mounting.

* *See these and our wide range of high quality electronic components including: Hermetically sealed potentiometer, fully Type Approved to Class H.I. of RCS. 121. Vitreous enamelled resistors, also Type Approved to Class H.I. of RCS.111.*

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BERCO

BR 1091—AH

453

PROTECTED by MULSIFYRE

Turbo-alternators at Croydon Power Station, B.E.A., with "Mulsifyre" equipment providing protection against fire in the oil of the lubricating system

MATHER & PLATT LIMITED

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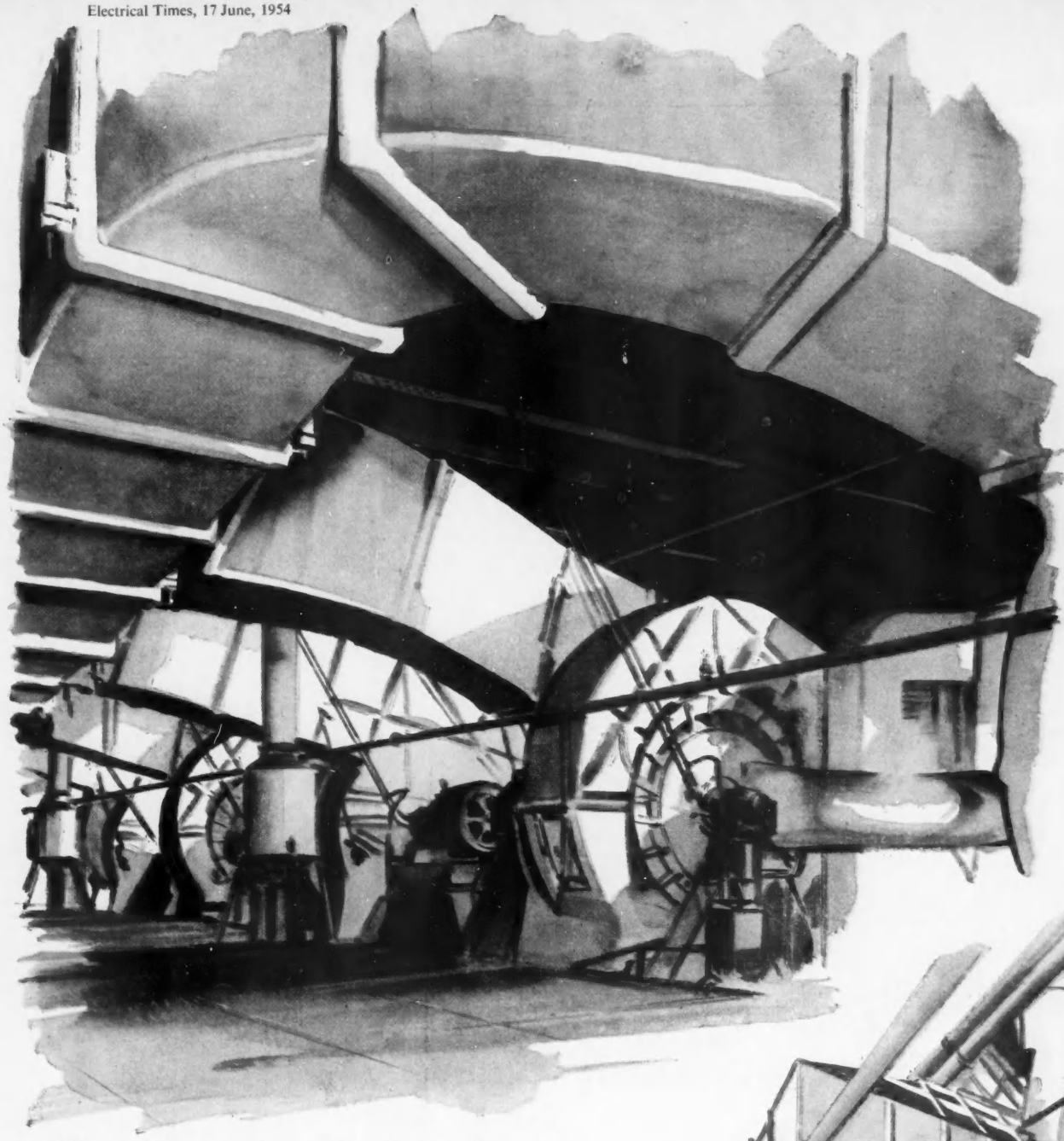

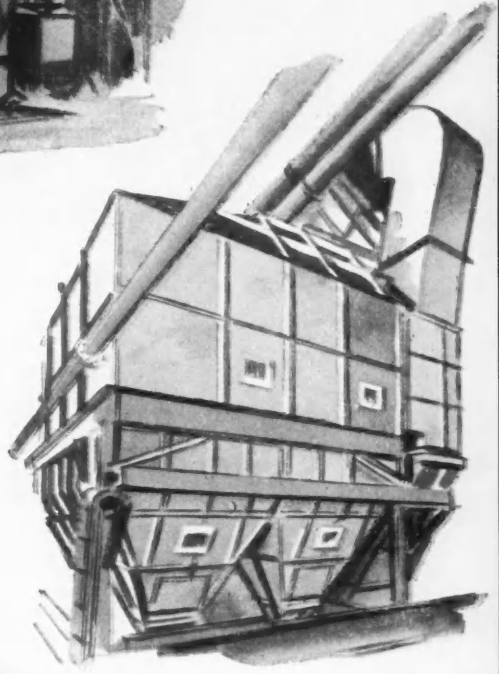

Howden induced draught fans with scroll collectors, at a south coast generating station
Below: Howden Centicell dust collectors at a London Power Station.

HOWDEN

JAMES HOWDEN & COMPANY LIMITED, 195 SCOTLAND STREET, GLASGOW, C.5, and 15 GROSVENOR PLACE, LONDON, S.W.1

Miniature bearings

TO ALL SIZES AND SPECIFICATIONS

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THE NEW MEM 'Autoline' STARTERS 1½ to 15 h.p.

Do you want the finest possible starter for valuable machine tools and other vital applications? Then here is your answer from MEM, the people with more than 30 years experience in large scale production of Motor Control Gear. The Autoline is new from start to finish, and is designed to stand up to heavy duty for a very long life and give complete protection to the motor. Outstanding features include :

- *Unit construction to meet a wide variety of purposes from one set of standard units.*
- *Precision overload relays with heaters designed specifically for individual motor ratings.*
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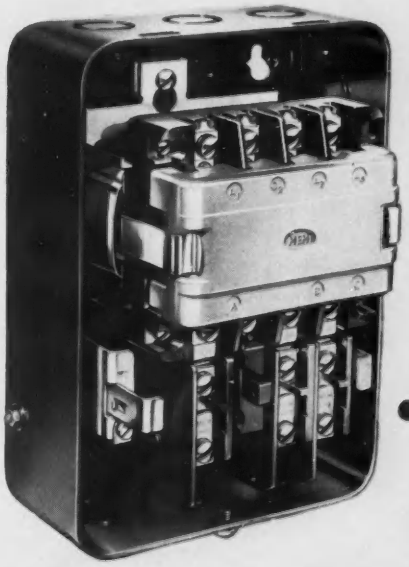

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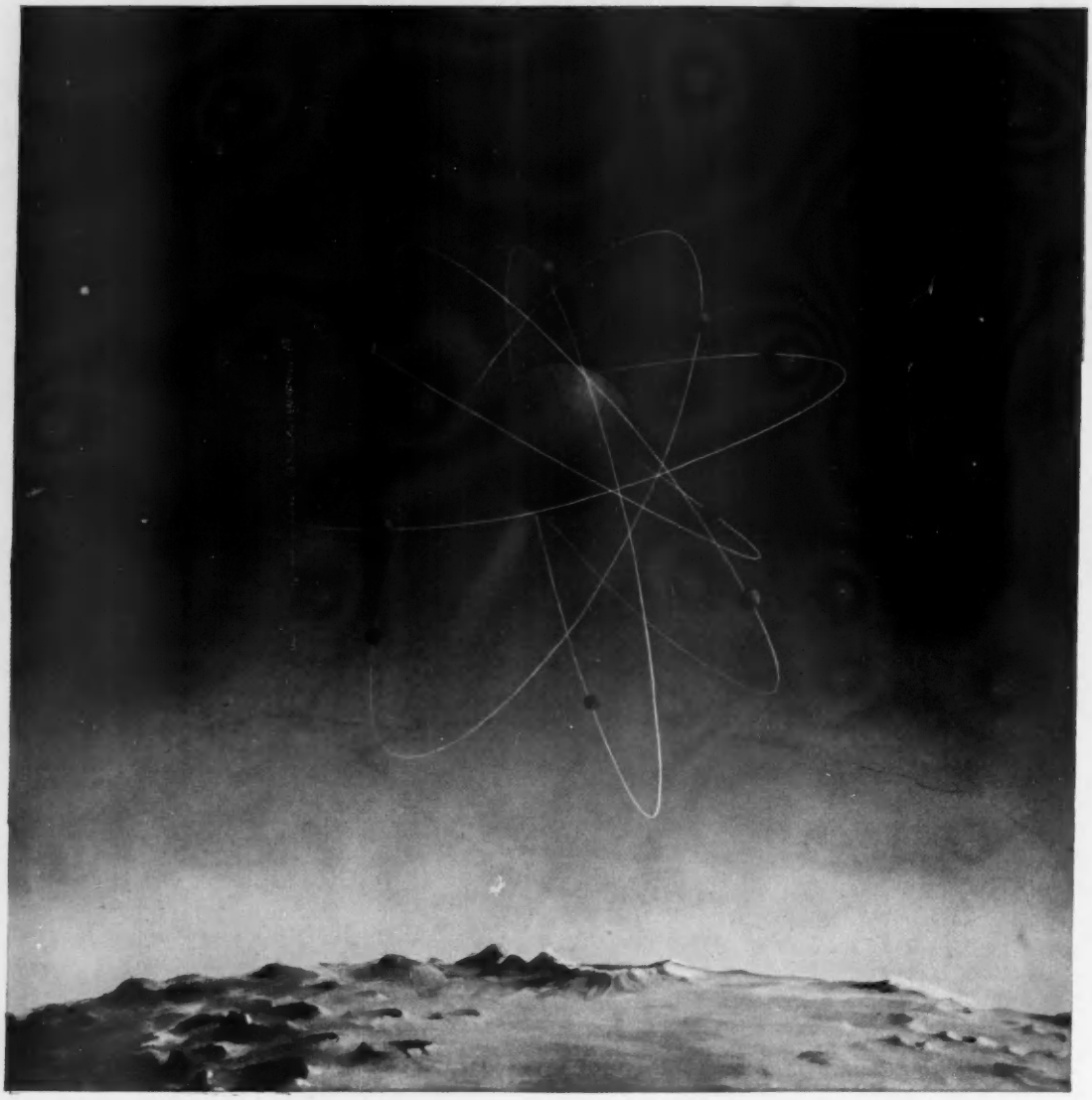

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Now the Engineer, advancing with the Scientist, finds himself on the very frontiers of human knowledge.

From there he sees with awe the vast potentialities, for good or evil, of atomic energy. Already he is striving with the Scientist to harness it for the benefit of mankind.

At **the first atomic electric generating station,** now under construction at Calder Hall in Cumberland, the turbo-alternators will be driven by *steam*, generated—by means of a nuclear reactor—in plant jointly designed by Babcock & Wilcox and the Department of Atomic Energy; and manufactured by Babcock & Wilcox.

Calder Hall, marking the first significant contribution of atomic energy to Britain's electrical power supply is the forerunner of much larger developments which, by conserving conventional fuel resources, will be of vital economic importance to Great Britain and, indeed, to the world.

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POWER STATIONS

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KEADBY

CARMARTHEN BAY
STOURPORT 'B'
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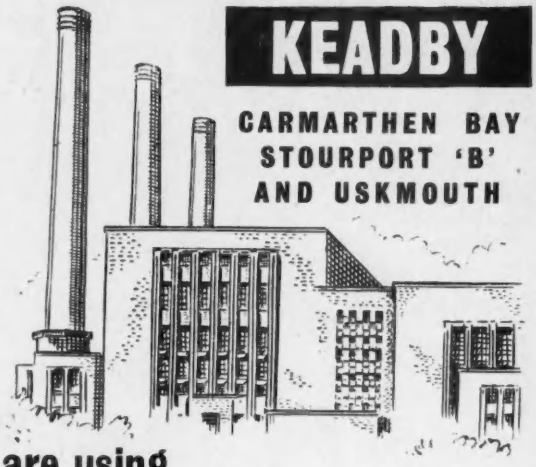
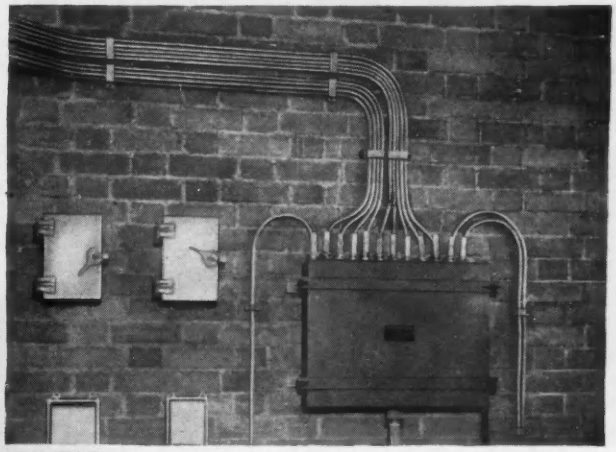
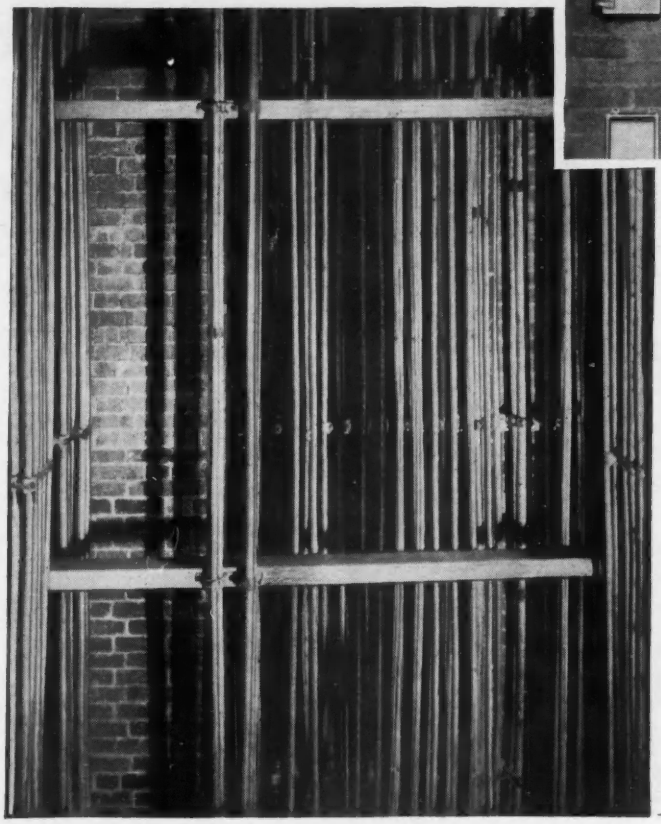


are using

J. & P.
ALUMINIUM SHEATHED
POWER & WIRING CABLES

BRITISH PATENT NUMBERS 627815 AND 627793





Above: Neatly installed formations of aluminium sheathed wiring cables terminating in a marshalling box.

Left: A main cable trunk at Keadby comprising 150 h.v. and l.v. cables, all but a few being aluminium sheathed.

Keadby is the first of several new power stations in which extensive use has been made of aluminium sheathed cables.

Three of the 60 MW sets are served by J. & P. Aluminium Sheathed Cables, a total of 73 miles of paper insulated and rubber insulated types being involved.

Photographs taken at Keadby Power Station.
Consultants: Messrs. Ewbank & Partners Ltd.
Cables installed by W. T. Henley's Telegraph Co. Ltd.,

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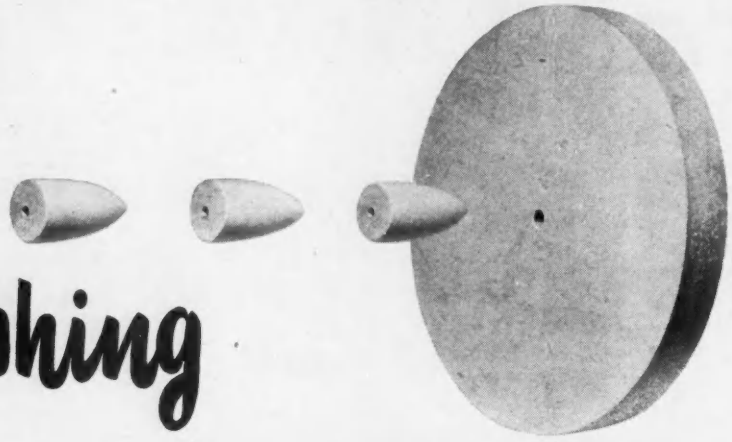
CHARLTON · LONDON · S.E.7

ELECTRICAL ENGINEERS & CABLE MAKERS

★ FIRST IN THE WORLD WITH ALUMINIUM SHEATHED CABLES



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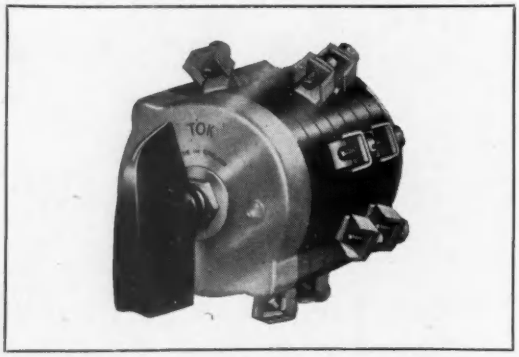

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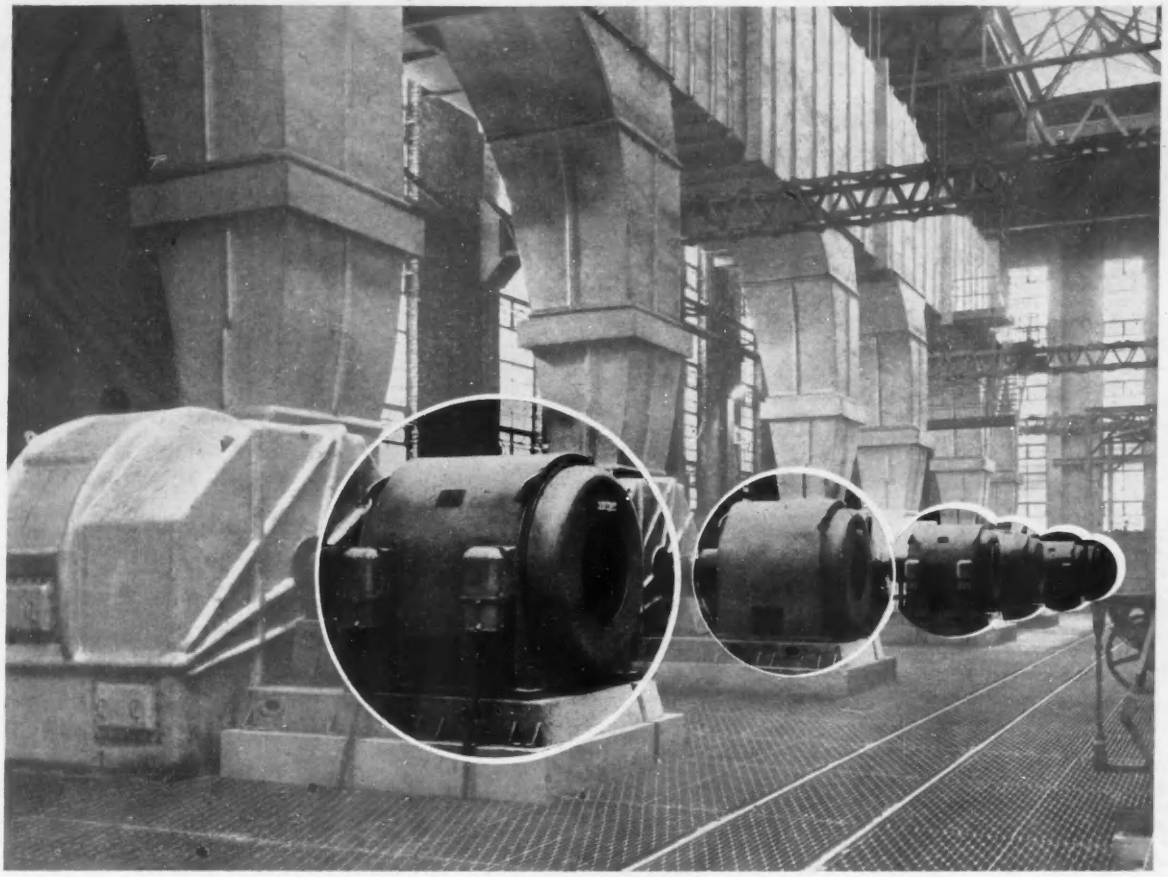

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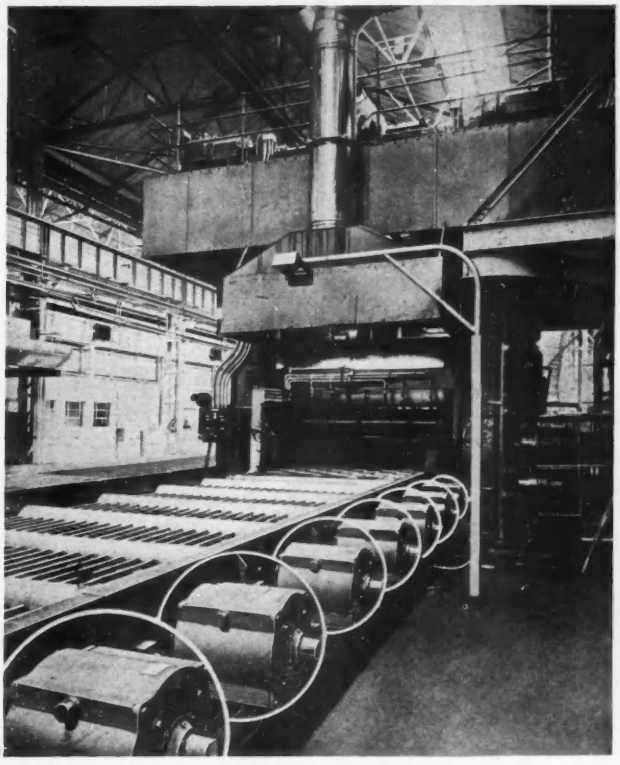
(Above : Some of the hundreds of motors serving the B.E.A.

Right : "Floating" type roller table motors in a modern aluminium mill.)



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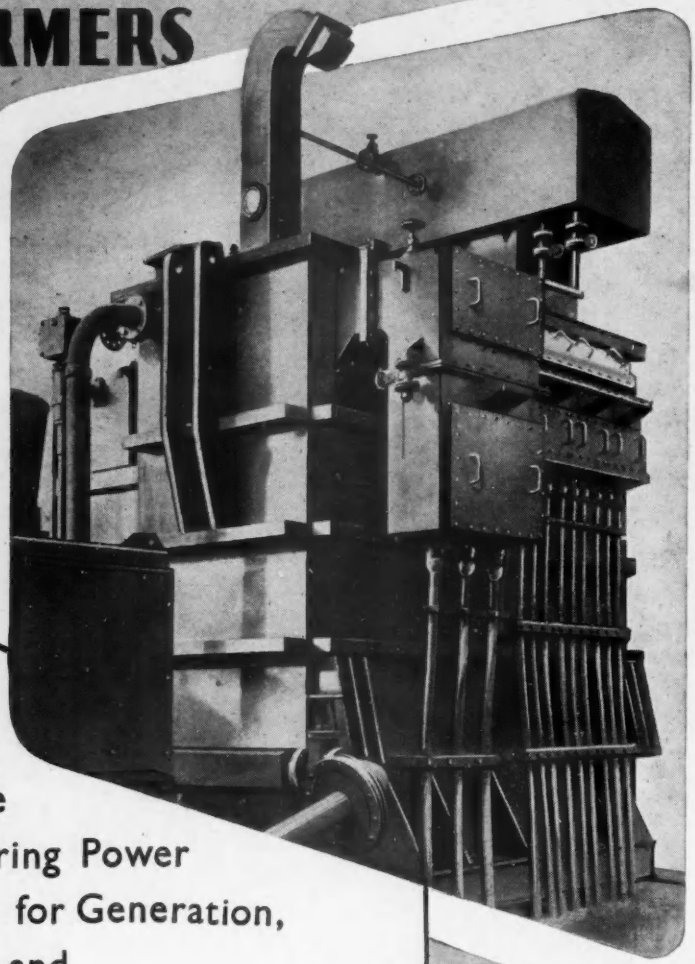

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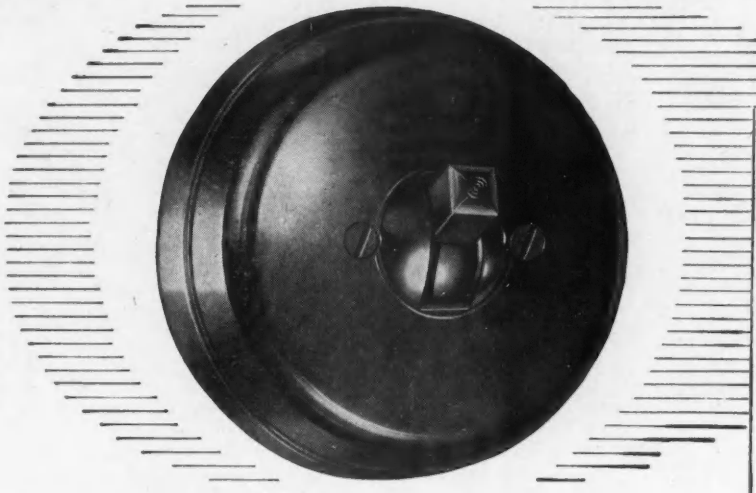

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Switches for B.S. 1299 boxes.
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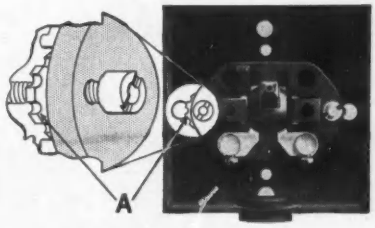
Simple method of adjustment in plaster depth boxes



The adjusting device, as illustrated above, supplied with plaster depth boxes provides a simple method of switch depth adjustment whilst the switch is in position. The adjuster **A** can be rotated until the switch is set at the required height.
Each side of the switch may be adjusted independently to compensate for irregularities in mounting the box.

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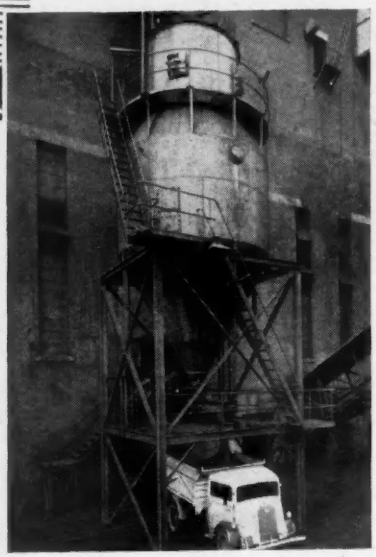

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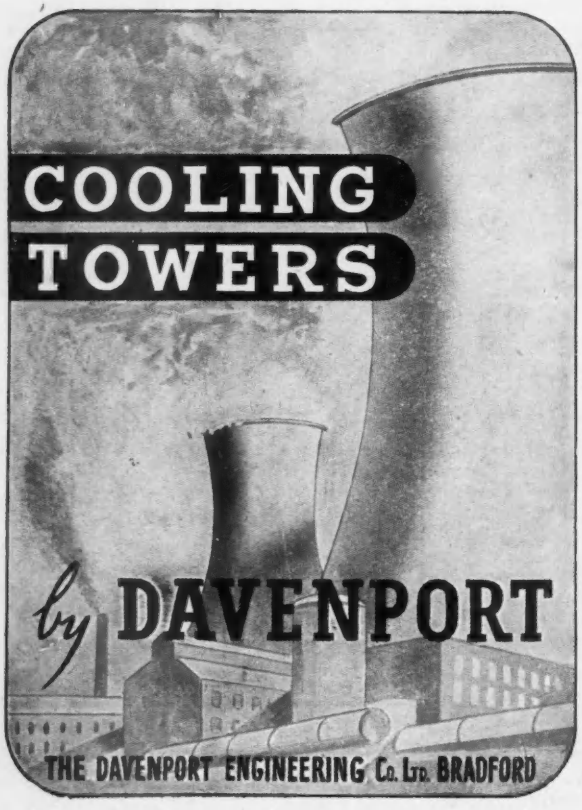

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Metering Current Transformer Type R 712
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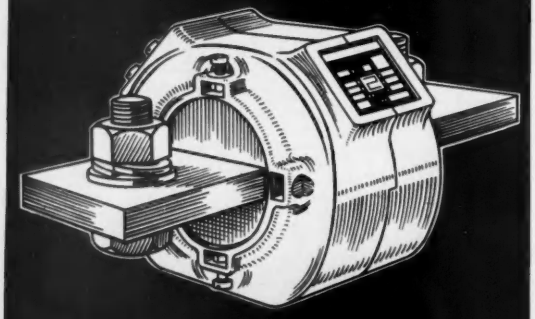

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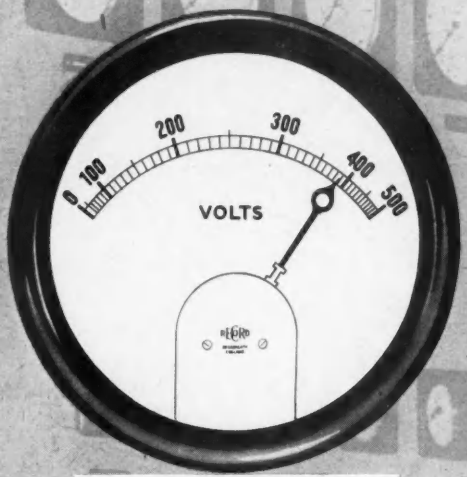

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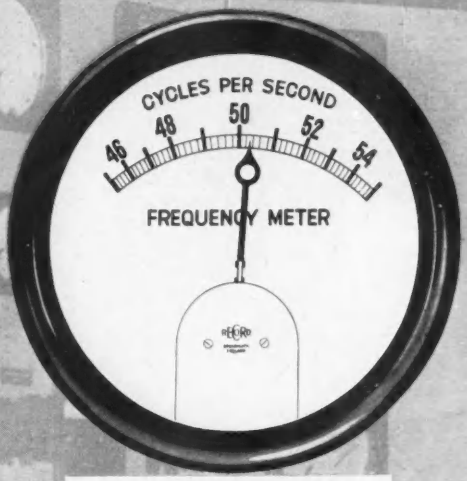
'CIRSCALE' INDUCTION WATTMETERS



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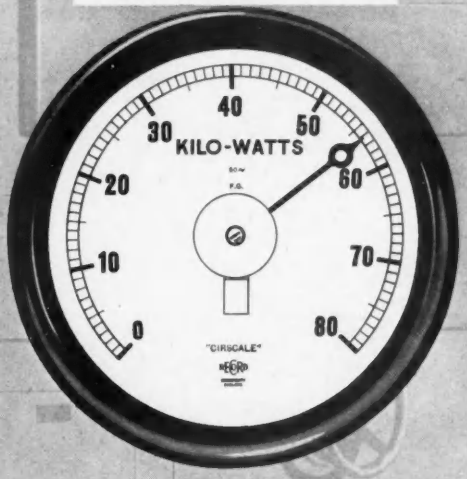

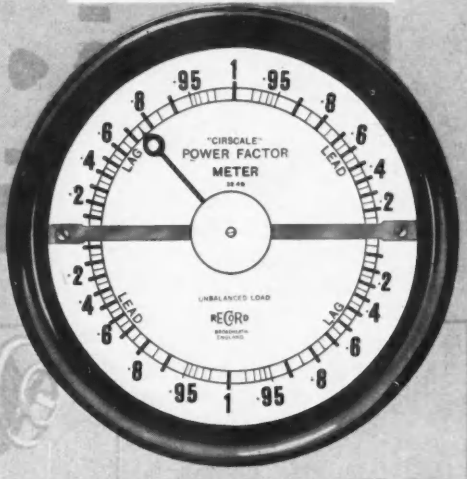

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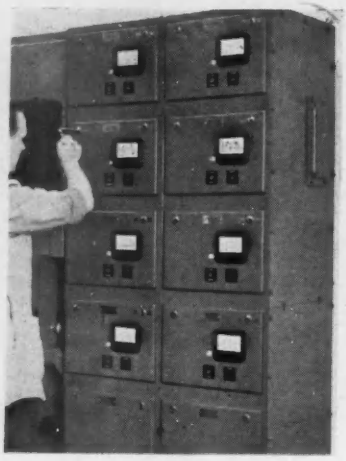

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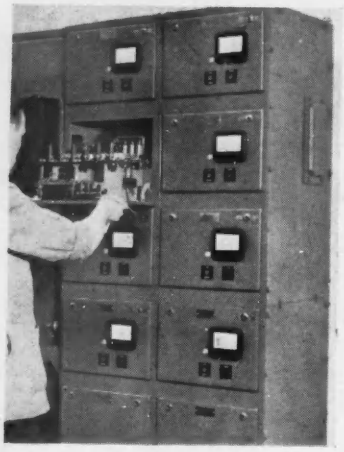

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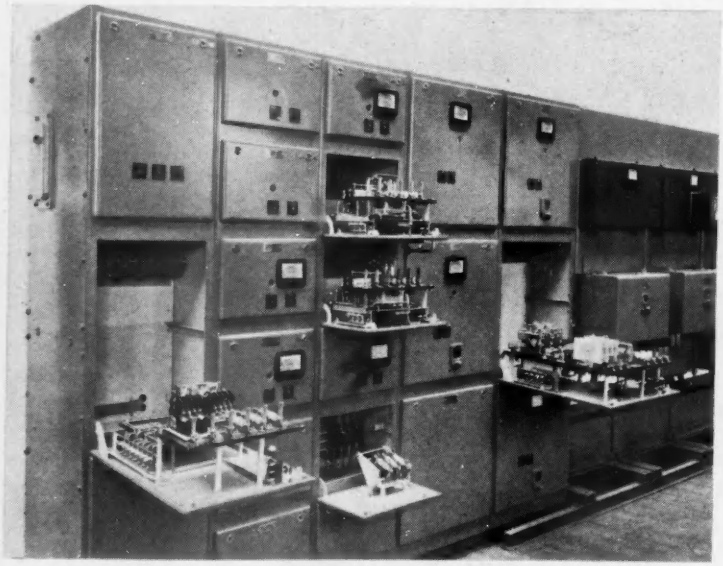

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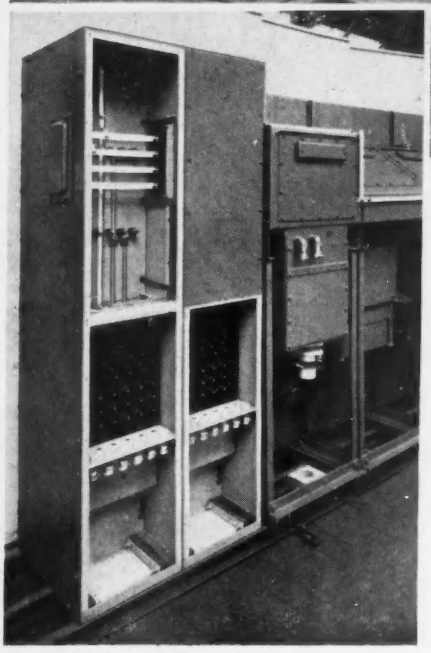

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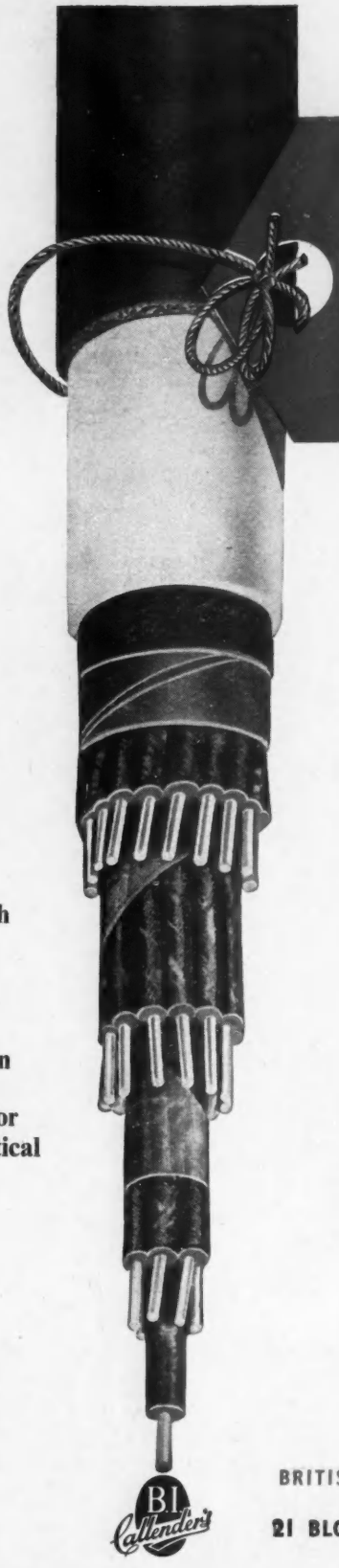

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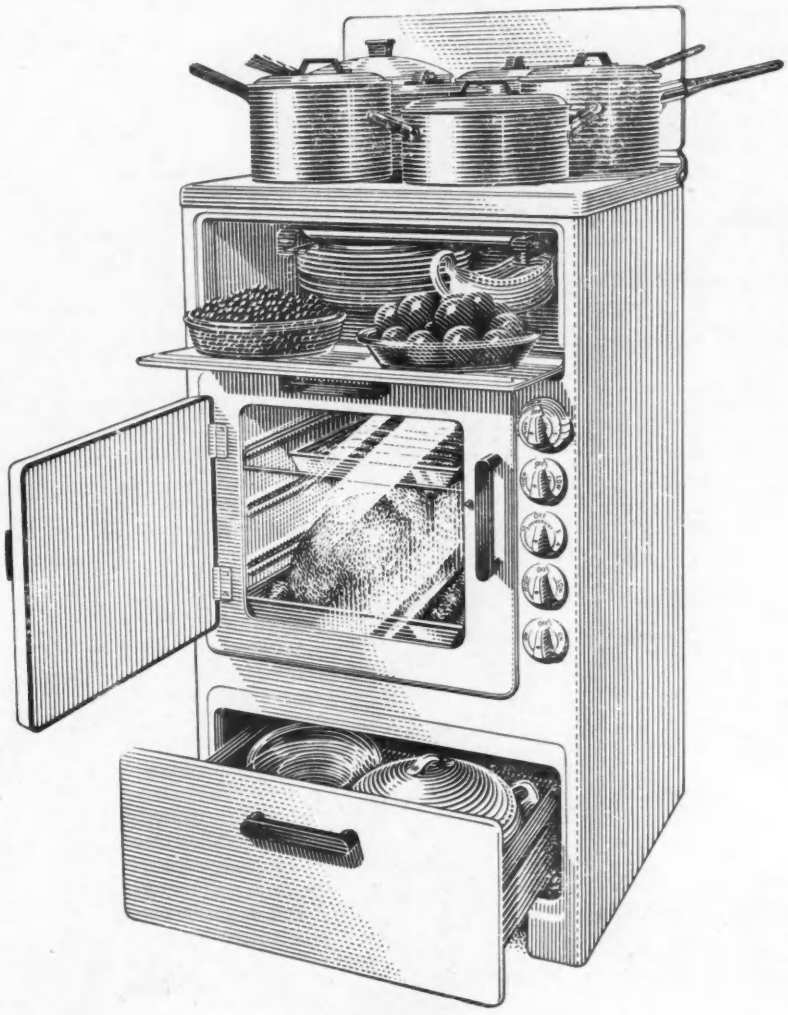

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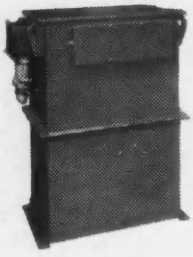

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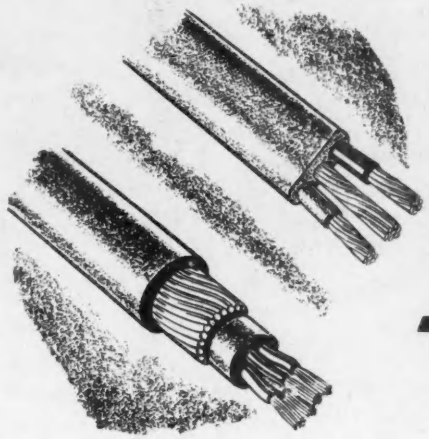

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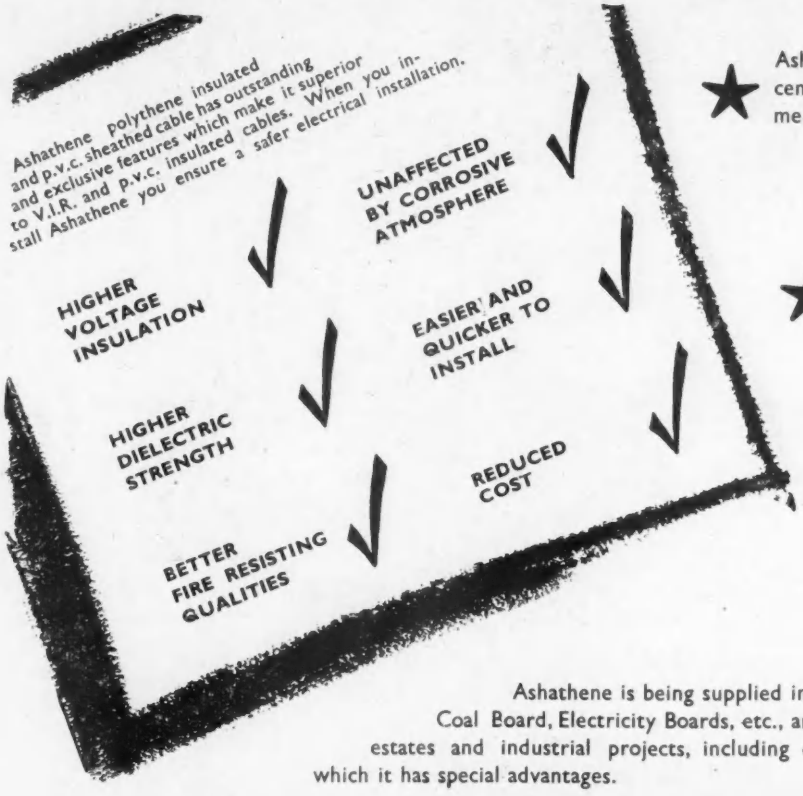
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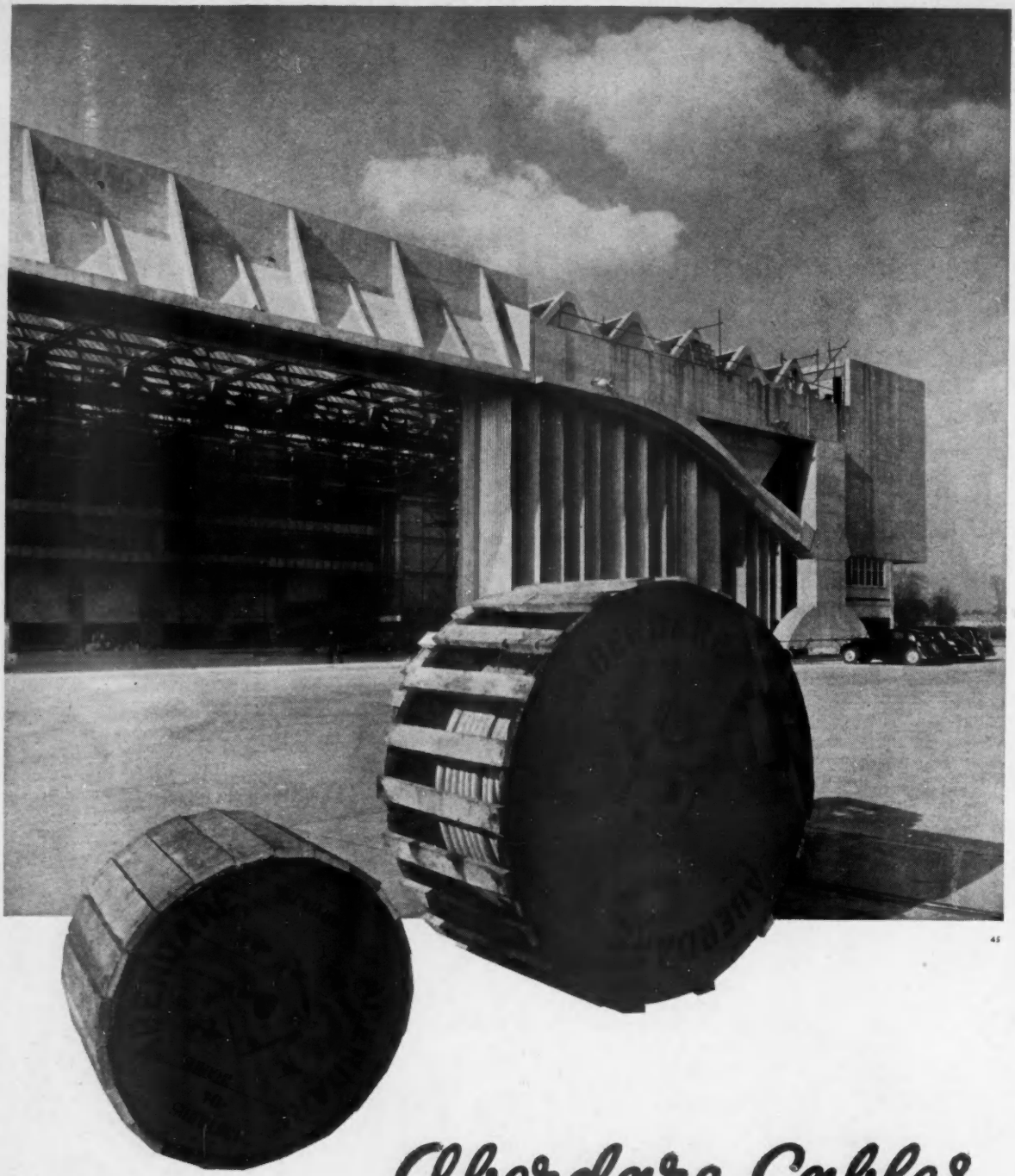

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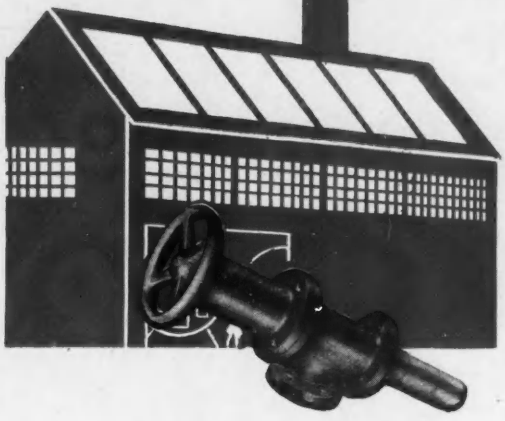

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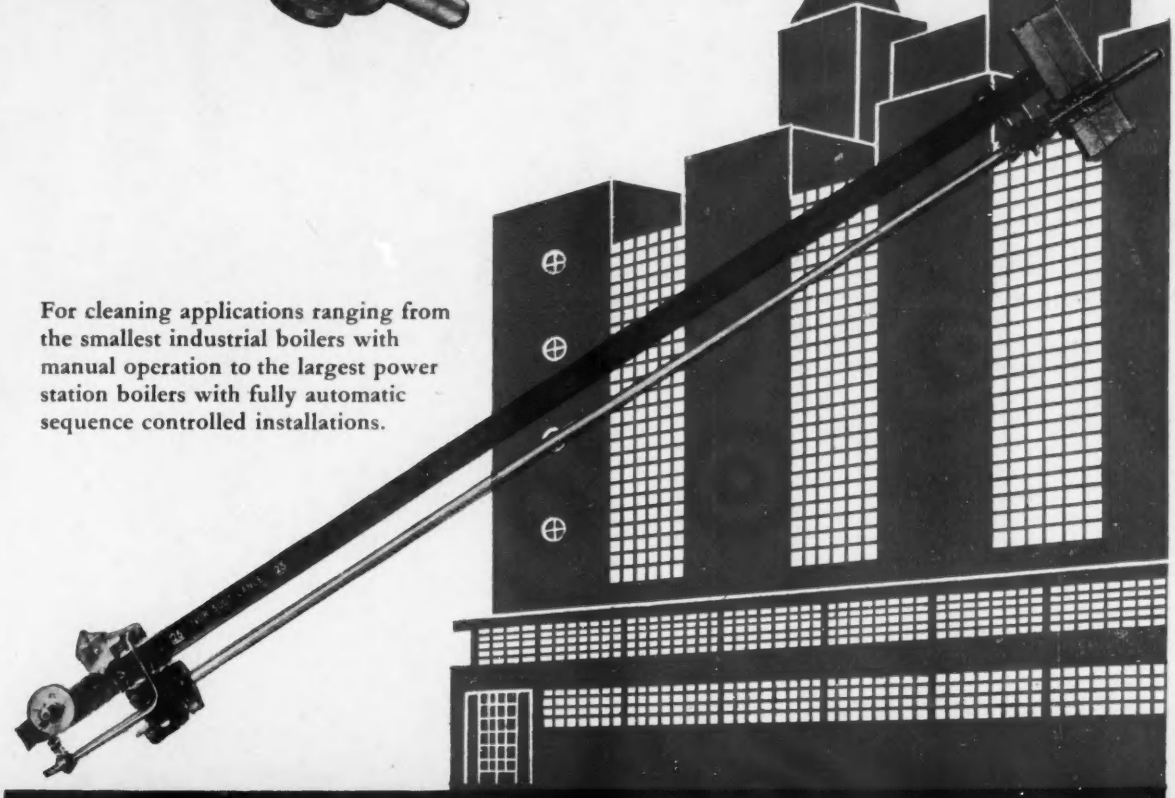

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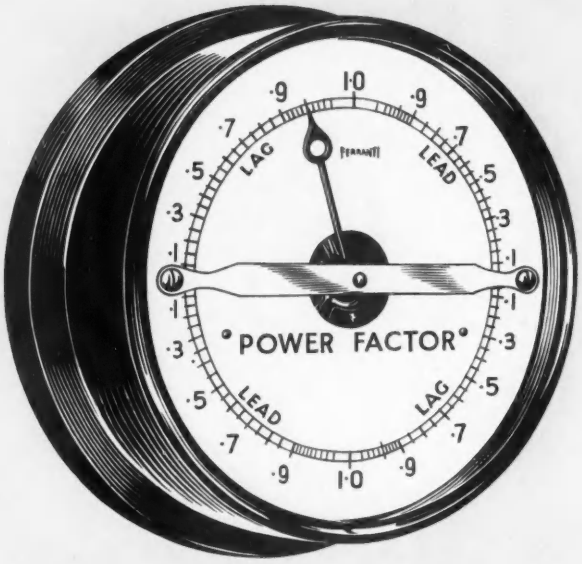
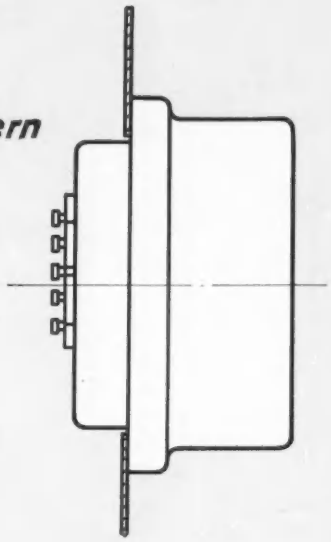


Round Pattern



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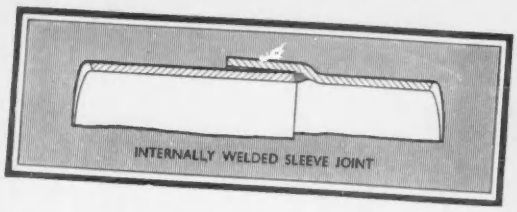

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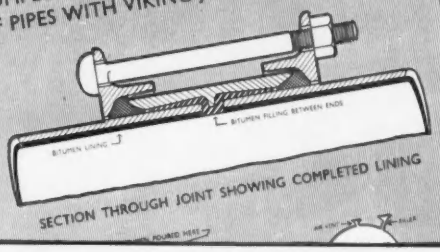

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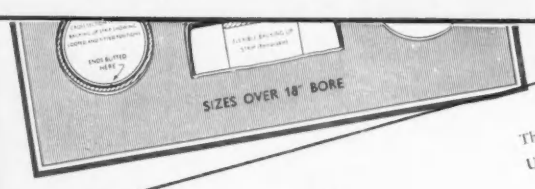
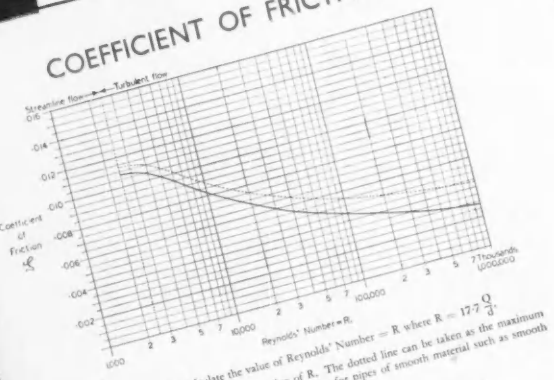
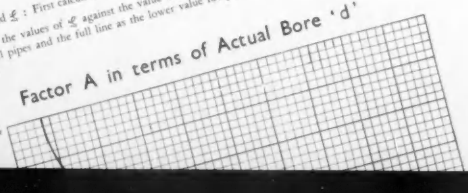


COEFFICIENT OF FRICTION



To find $\mathcal{L}$: First calculate the value of Reynolds' Number = R where $R = 17{\cdot}7\,\frac{Q}{d}$.

Then read off the values of $\mathcal{L}$ against the value of R. The dotted line can be taken as the maximum value for steel pipes and the full line as the lower value for pipes of smooth material such as smooth drawn brass.



The graph opposite gives the values of A for the usual range of d.

Unwin's formula is

$$q = 76\sqrt{\left[\frac{d^5}{d+1{\cdot}714}\cdot\frac{P_1^2-P_2^2}{LU}\right]}\ \text{Cu. ft./sec.} \quad \ldots\ldots(1)$$

from which any of the variables can be determined if the others are known.

To find the initial or final absolute pressures, the formula can be written

$$P_1 = \sqrt{\left[P_2^2+1{\cdot}75\,q^2\,LU\left(\frac{d+1{\cdot}714}{d^5}\right)\right]} \quad \ldots\ldots(2)$$

$$P_2 = \sqrt{\left[P_1^2-1{\cdot}75\,q^2\,LU\left(\frac{d+1{\cdot}714}{d^5}\right)\right]} \quad \ldots\ldots(3)$$

while if the diameter is to be found, a close approximation is

$$d = \sqrt[5]{M}\left(\frac{1{\cdot}37+\sqrt[5]{M}}{1{\cdot}03+\sqrt[5]{M}}\right) \quad \ldots\ldots(4)$$

where $M = \frac{1{\cdot}75\,q^2\,LU}{P_1^2-P_2^2}$

for all values of d not less than 3.

Lacey's modification of Unwin's formula is

$$Q = 182\sqrt{\left[\frac{d^5(P_1^2-P_2^2)}{d'\,LU}\right]}\ \text{Cu. ft./sec.} \quad \ldots\ldots(5)$$

or

$$q = 4865\sqrt{\left[\frac{d^5(P_1^2-P_2^2)}{d'\,LU}\right]}\ \text{Cu. ft./sec.} \quad \ldots\ldots(6)$$

where $\mathcal{L}$ is the coefficient of friction, to be read from the appropriate curve opposite for the value of Reynolds' number, R, given by $R = 17{\cdot}7\,\frac{Q}{d}$.

The lower curve may be taken as the lower limit for practical purposes, the dotted line is that determined by Lacey for cast iron pipes. In the absence of data entitling a smaller value of $\mathcal{L}$ to be used the dotted curve may also be applied to steel pipes.

The above formula can be applied directly to single mains if P_1, P_2, or L is to be found but if d, v and Q are unknown an approximate value must be assumed and checked above, and corrected as necessary. Such an initial value can be found from Unwin's formula if Lacey's is preferred for final use.

Meaning of Symbols

= actual bore of pipe, in inches.

= ing, in feet.

= ue pressures re-

Q = flow at atmospheric pressure, cubic feet per hour.

q = flow at atmospheric pressure, cubic feet per second.

U = specific gravity of gas relative to air as unity.

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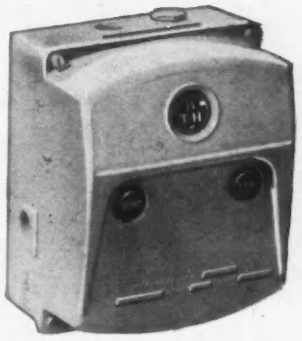

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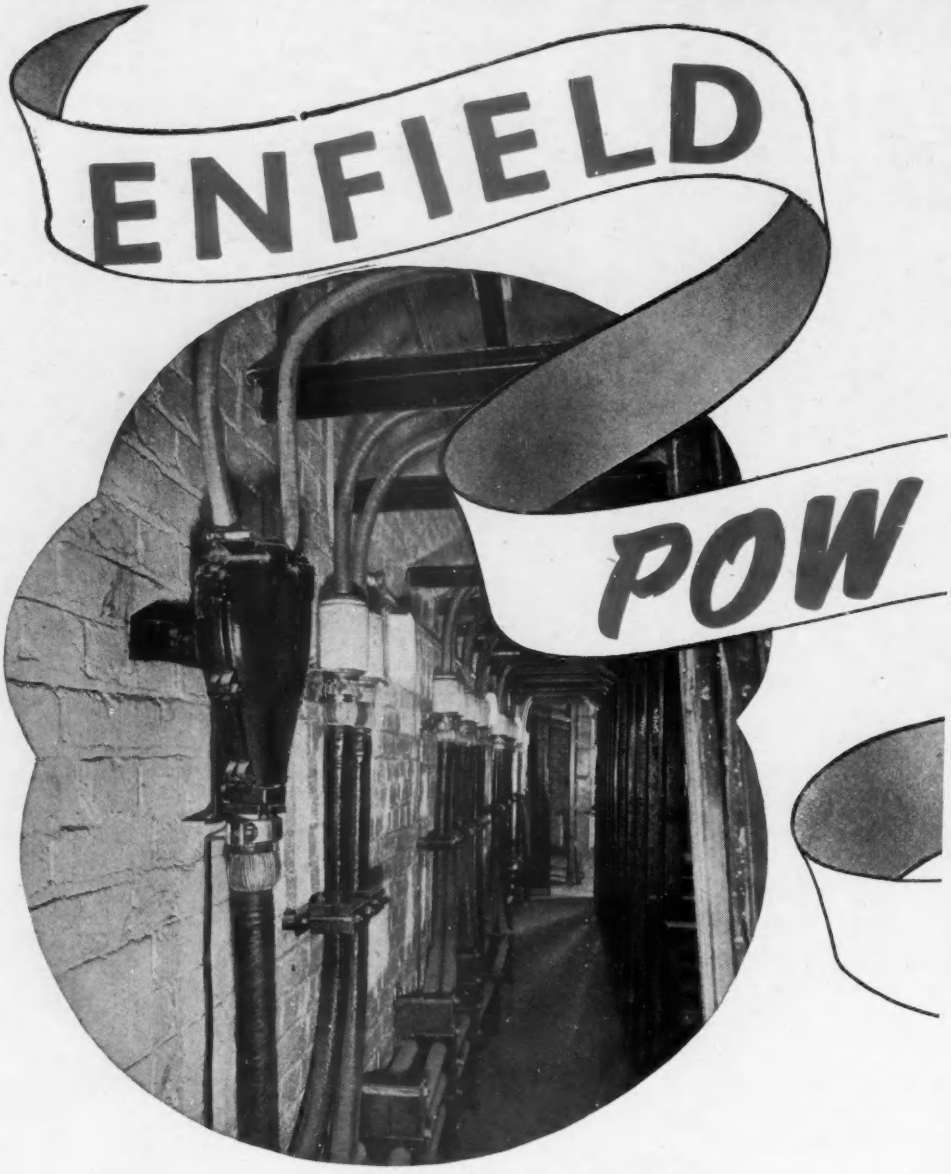

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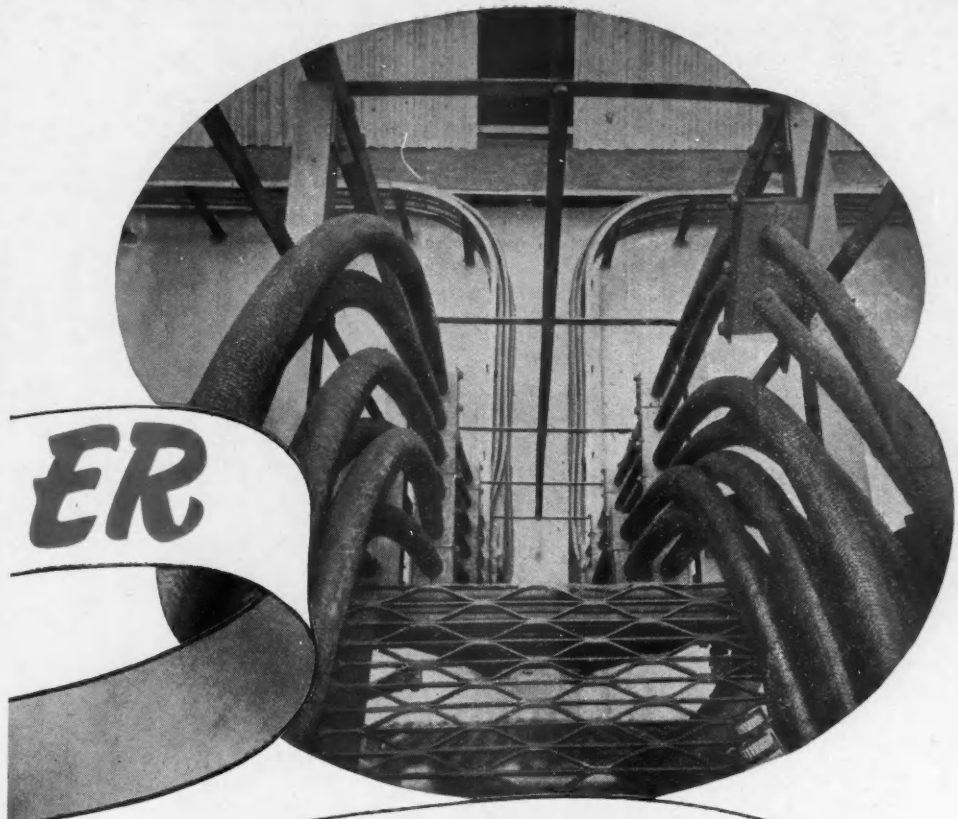

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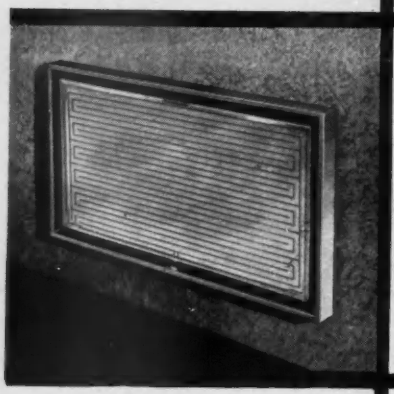

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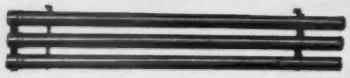

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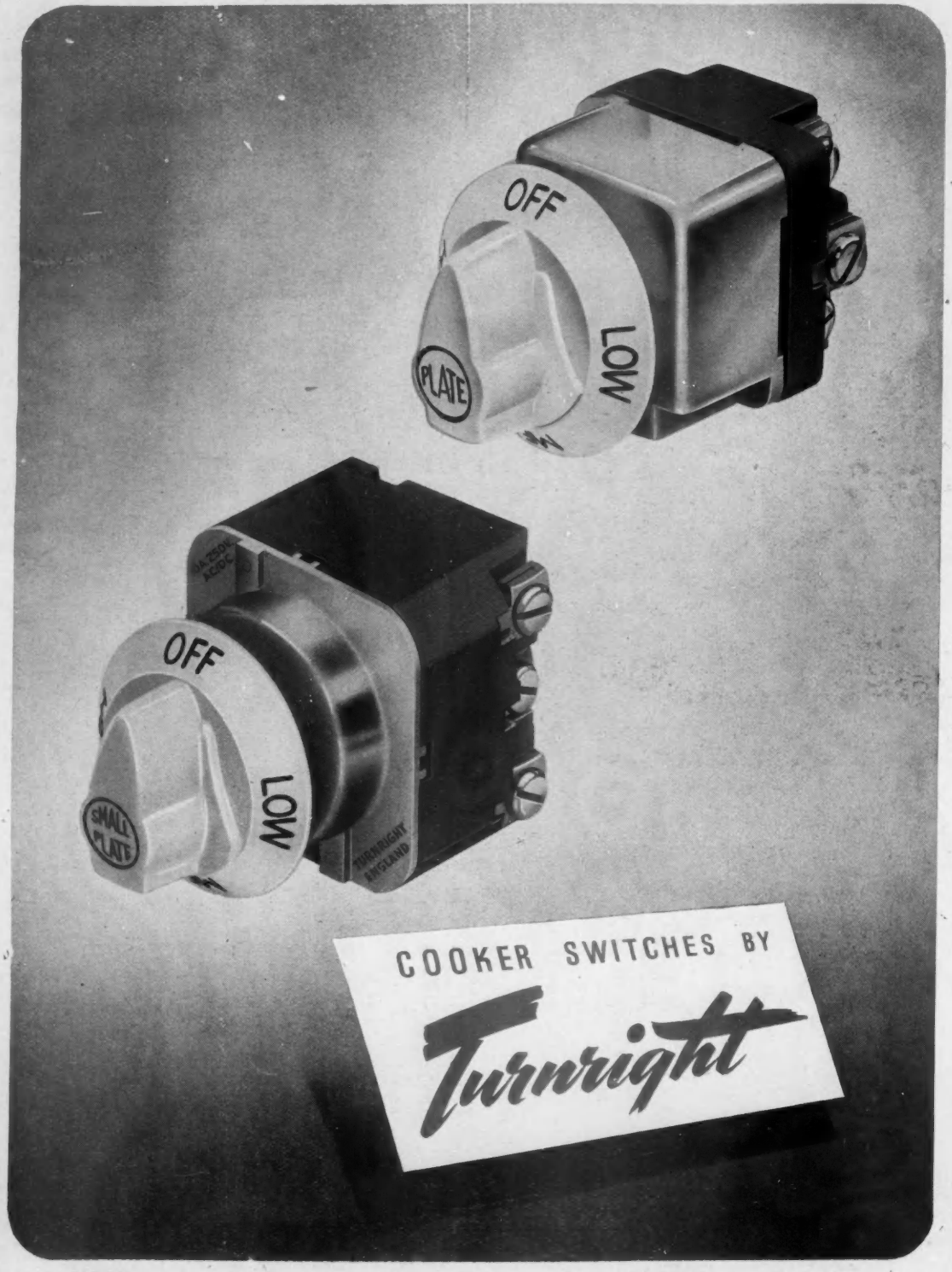

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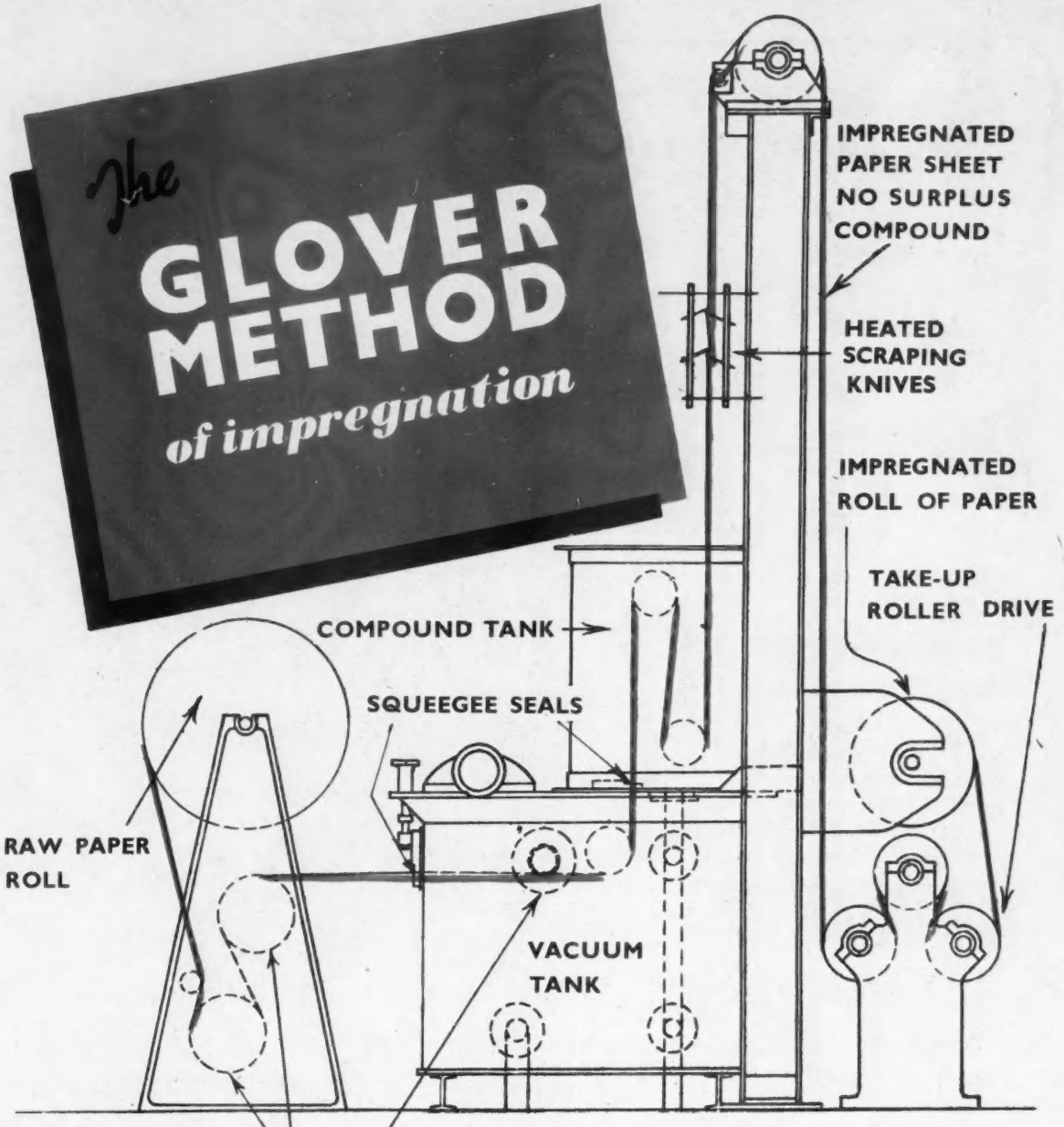

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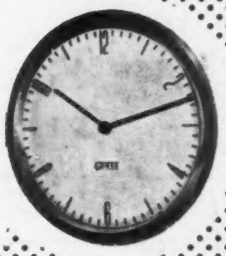

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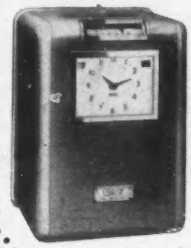

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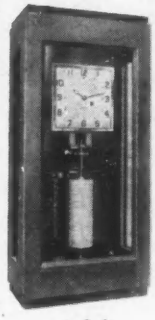

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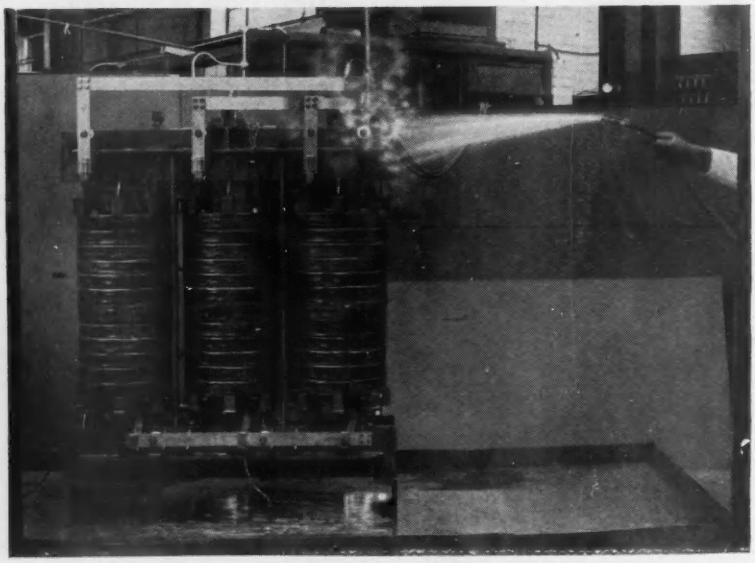

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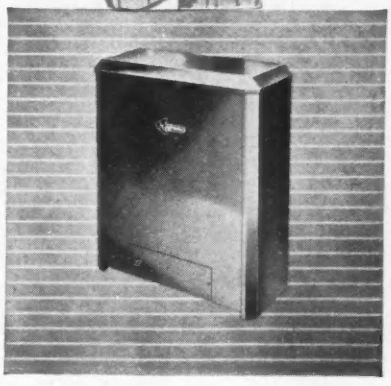

Nightstor *heater*

a G.E.C. *product*

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Oven with forced air circulation fitted with temperature recorder.

A

HEDIN

PRODUCT

INDUSTRIAL OVENS

Convection and Forced Air

Close temperature control to 400° C. standard range and to specification.

Also manufacturers of a full range of industrial heaters and resistance units.

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ELECTRIC ARC WELDING IS INCREASING

Rentweld supply every need

from 20 to 450 amperes output on* ONE *machine

THREE YEARS'

Insurance Policy

AGAINST DEFECT

***FREE* ON REQUEST**

WITH THE

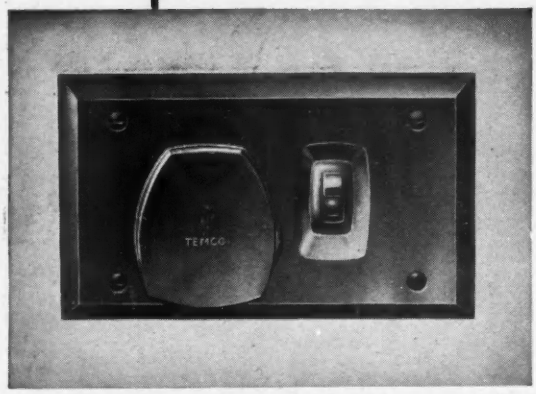
RENTWELD

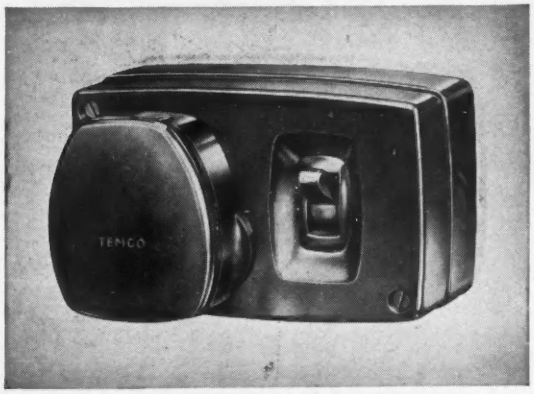
94 CAMDEN ROAD,

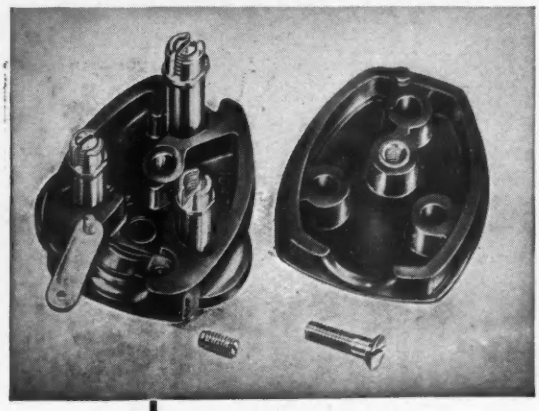
N.W.1 ***Phone : GULliver 6006***

Examples of RENTWELD *value*—**450 ampere model (illustrated) £140 with accessories. Complete outfits (oil cooled) from £50. 160 Ampere £50 model deposits 8g. electrodes continuously. 240 Ampere £80 model deposits 4g. electrodes continuously. Four different sizes available. Please send for illustrated literature.**

TEMCO







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- ★ 5 and 15 amp. 3-pin to B.S.546
- ★ Surface and Flush
- ★ Single and Double Pole
- ★ Brown and Cream
- ★ Neat, attractive, individually packed
- ★ Designed for easy wiring
- ★ High quality at low price

If you have not received details of these new TEMCO Switch Sockets and Plugs, please write for the full descriptive leaflet.

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SPECIAL SELLING FEATURES

Burco

MODEL E.950 A.S.

ELECTRIC WASHBOILER

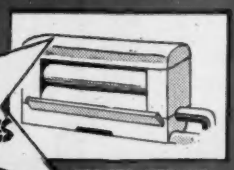
WITH FOLDING WRINGER

★ IN CREAM AND EAU-DE-NIL OR RED AND WHITE

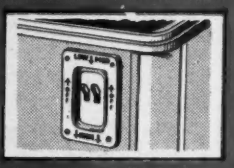
Destined to become the most wanted electric washday appliance. When fitted with the BURCO Agitator Unit it becomes a complete washing unit for **£25·1·4** and represents the finest value today.

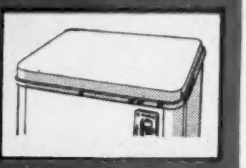
Modern in design and obtainable in alternative two-colour combinations, it is assured of a place in any modern kitchen.

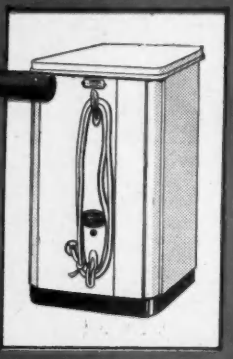
The E.950 boils the water, is easy to operate, extremely rigid, economical and clean in use and still another BURCO Winner.

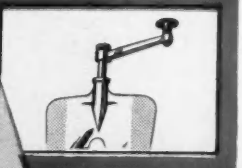

PRE-SET SPRUNG WRINGER

SIMPLE WRINGER STORAGE


TOP LEVEL SWITCH


COOL TABLE TOP


EXTERIOR CABLE HOUSING


AGITATOR UNIT

BURCO—THE BEST

no purchase tax!

BURCO LTD

ROSE GROVE, BURNLEY, LANCS

the Aristocrats of electric Washday Appliances

Also makers of the famous "BURCO" all-electric Washing Machine.

PRICE £23-5-10

"BURCO" Automatic Safety Cut-out £1 extra

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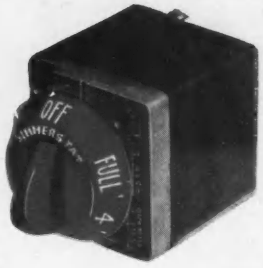
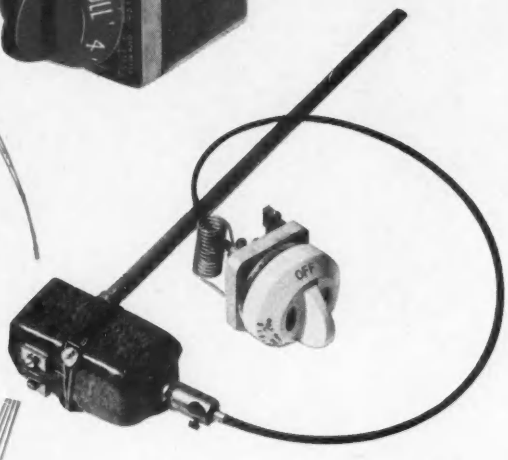


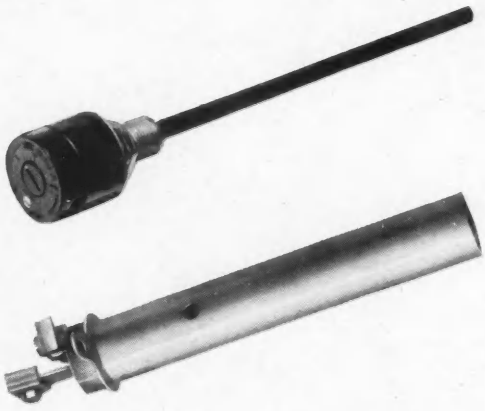
THE SIMMERSTAT

—the "electric tap" for boiling plate control



THE SUNVIC OVEN THERMOSTAT

with flexible drive



THE SUNVIC "type TQA" WATER HEATER THERMOSTAT

THE New SUNVIC WATER HEATER THERMOSTAT

EQUIPMENT BY SUNVIC

SUNVIC CONTROLS LTD. (Domestic Division), No. 1 Factory, Eastern Industrial Estate, HARLOW, ESSEX. Tel.: Harlow 24231/5

Manufacturers of the Simmerstat, Oven Thermostats, Radiant Hotplates and Pneumatic and Electrical Instruments for detection, measurement, control and recording of Temperature, Flow, Liquid Level, Specific Gravity, and Pressure, in Science and Industry. Vacuum Pumping and Measuring Equipment, etc.

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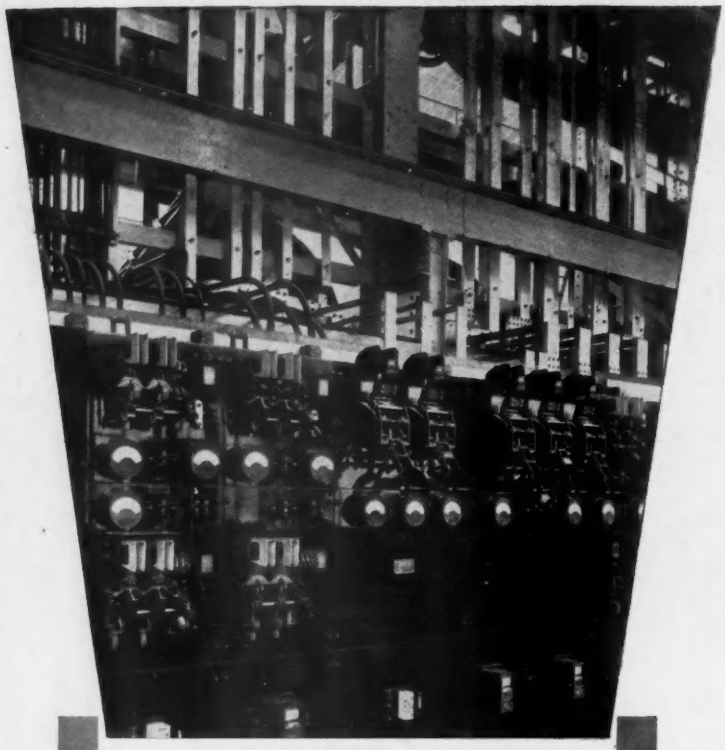

YEARS OF GOOD CONDUCT

Clean, durable and possessing a high degree of conductivity, T.I. Aluminium is a first class material for the making of bus bars.
Its amazing resistance to corrosion allows it to be used in even the worst industrial atmospheres without maintenance, and its lightness—it is only one-half the weight of copper of equal conductivity—speeds up installation time, particularly in difficult situations.
When next you are thinking in terms of bus bars—

PUT Aluminium FIRST
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BILLETS, SLABS, SHEET, STRIP, PLATE, TUBES AND EXTRUSIONS TO ALL COMMERCIAL, A.I.D. AND LLOYD'S SPECIFICATIONS.

STEAM

When British Industrial Solvents Ltd. extended their Hedon Works in Hull to meet the growing demand for 'BISOL' products, Simon-Carves erected the new boiler house steelwork and installed three stoker-fired 50,000 lbs per hour boilers and ancillary equipment, together with feed heating, water treatment and coal handling plant; steam conditions for the new boilers are 650 p.s.i. and 750° F. Steam power by Simon-Carves serves many industries, from steel-making to beet sugar extraction.

Steam power by ***Simon-Carves Ltd***

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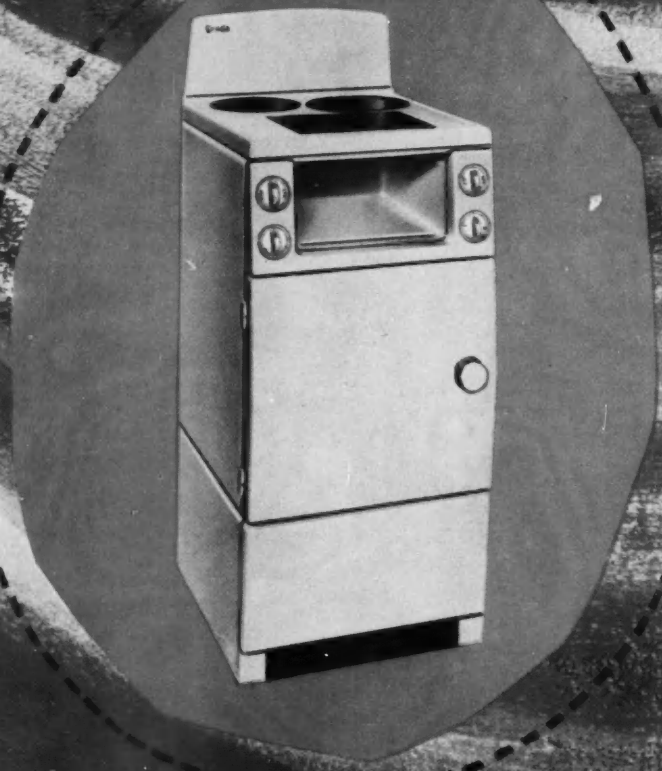
OVERSEAS COMPANIES | *Simon-Carves (Africa) (Pty) Ltd : Johannesburg* *Simon-Carves (Australia) Pty Ltd : Sydney*

the new **Creda Star**



the most interesting cooker produced in years

- in price
- in performance
- in construction

Write for details to

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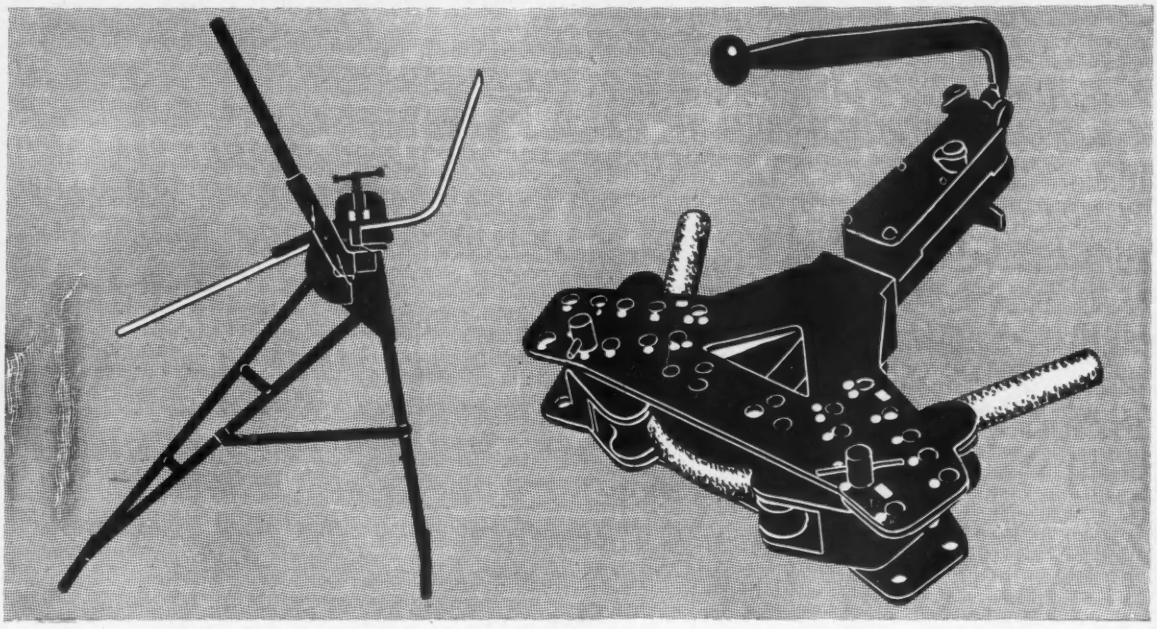
Electric Company Limited
Creda Works, Hythe Bridge, Staff.

Bending Tubes



T.4 HAND/STAND BENDING MACHINE

The Tubela Model T.4 Tube Bending Machine is designed for bending ½″ - 1¼″ copper tube and ⅜″ - 1¼″ electrical conduit. Accurately machined formers and guides ensure full 180° bends to a throat radius of approximately 3½″ × tube diameter. Supplied with the portable stand which forms an integral part of the unit and incorporating a fitting for a Pipe Vice, the T.4 is ideal for electrical installation and maintenance work.

H.3 HYDRAULIC BENDING MACHINE

Model H.3 Hydraulic Bending Machine fitted with 180° Bending Attachment is designed to bend cold and unloaded up to 180°, all classes of steam and gas tubing from ½″ - 2″ i.d. An extension Wing Head is available to increase the range to 2½″ and 3″ i.d. (for 90° bends only). An outstanding feature of the H.3 power unit is the **solid 60 ton high tensile steel** double acting ram running in bronze liners ensuring smooth travel and long life to the machine.

Full details and illustrated catalogue sent on request.

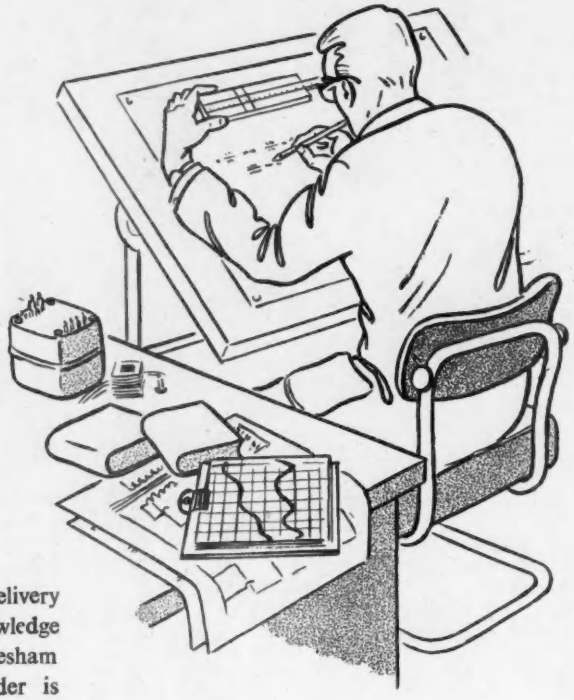
Tubela

Tubela Engineering Company Limited

Furze Street, Bow, London, E.3. Tel: East 4771

D

From DESIGN to DELIVERY



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Specialist Design Staff and Specialist Delivery Vehicles are typical of the care and knowledge which are involved in the making of every Gresham Transformer. From the moment the order is received each stage in production is s pervi>ed and checked so that nothing is left to chance.

Our representatives are specialists too, and, if you telephone FELtham 2271, your enquiry will be handled by engineers with experience of your type of problem.

HANWORTH **GRESHAM** TRANSFORMERS LTD MIDDLESEX

TWICKENHAM ROAD, HANWORTH, MIDDLESEX. ***FELtham 2271-4***

"SindanyO"

Asbestos Electric

ARC & HEAT RESISTING BOARDS

NATURAL GRADE

"Sindanyo" Natural Grade is classed as a Non-Ignitable Board under British Standard Specification 737. Supplied in the form of standard sheets 4 ft. x 3 ft. in thicknesses from $\frac{1}{8}$ in. to 3 in. It is similar to the Ebony Grade in its machining properties. Natural Grade "Sindanyo" is suitable for continuous working temperatures up to 350° C., but is frequently employed under more severe conditions of temperature under compression loading or where it may be unstressed mechanically. Natural Grade "Sindanyo" may also be treated so as to resist moisture absorption and to improve its electrical characteristics. Colour: Grey. "Sindanyo" Boards, Ebony Grade, are available for electrical insulating purposes.

TURNERS ASBESTOS CEMENT CO LTD

A MEMBER OF THE TURNER & NEWALL ORGANISATION

TRAFFORD PARK MANCHESTER 17

S.7

Photo by courtesy of THE BARNHALL DANCE CENTRE

★ STREAMLINED GRACE

★ CONTROLLED ENERGY

★ PERFECT PERFORMANCE

3 models—TAX FREE

★THERMODARE—THE OFF-PEAK ELECTRIC STORAGE HEATER

THERMODARE TECHNICAL SERVICE

Our Technical Service will be pleased to discuss your heating problems, and can help you materially by providing information, calculating heat losses, etc., for any type of industrial or commercial building.

THERMODARE (GREAT BRITAIN)

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Telephone: ABBey 1060/3348

and at 700, ARGYLE STREET, GLASGOW, C.3 *'Phone: City 7715/7*

Why buy extra FUEL?

buy a Crockatt VALVE RESEATER

and cut out steam losses

This tool not only saves steam—and therefore fuel—but saves time and dislocation of work as the valve can be reseated WITHOUT BREAKING THE PIPELINE. It takes only one man to operate it and it gives a true face free from knurling in a few minutes. It is self-centring in the valve chest and the cutter is visible during the reseating operation. Moderate in price—write for full descriptive literature.

Other Crockatt specialties

Electric Salinometers
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Boiler Tube Brushes
Floor Sanders
Terrazzo Polishers, etc.
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Delivery Ex Stock

W. CROCKATT & SONS LTD.

79 DARNLEY ST., GLASGOW, S.1

SMITHS *Count in Industry*

SMITHS

Electric Hours Counter

How long has it been running?
When is it due for maintenance?
When was it last overhauled?

These questions and more can be answered by fitting a Smiths Electric Hours Counter. Connected in parallel with the electric supply circuit this self-starting counter indicates the hours that equipment has been in use. When plant is on hire, the charge can be based on the number of hours of operation.

The counter indicates in 1/10ths of an hour up to a total count of 10,000 hours, after which it returns to zero, and it can be supplied for use in any normal electrical circuit.

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Chronos Works: NORTH CIRCULAR ROAD, LONDON, N.W.2
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The Industrial Instrument Division of S. SMITH & SONS (England) LTD.

188-245A

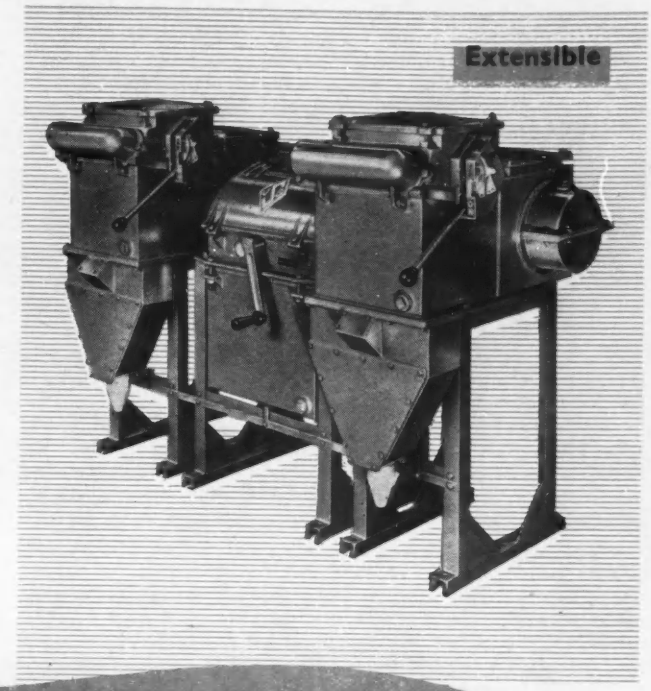
RING MAIN TEE-OFF

Rupturing capacity 250 MVA ASTA. Tested at both 6.6. and 11 kV with fault making load breaking Isolators.

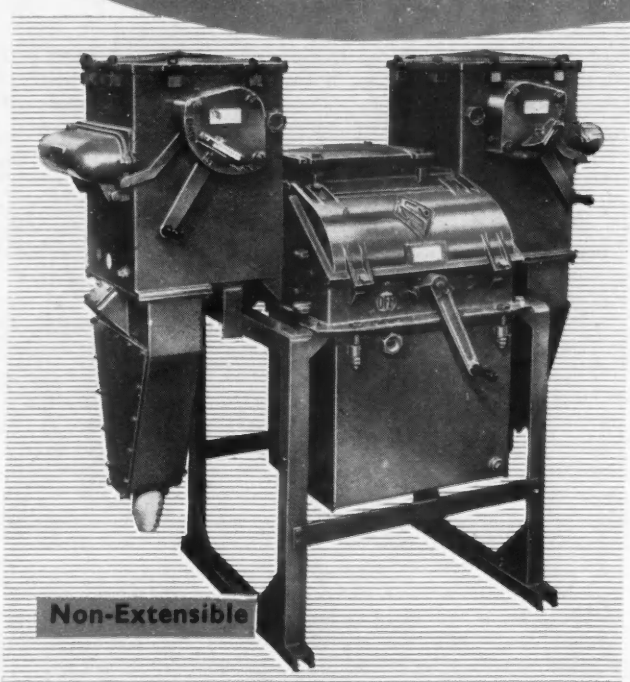
Impulse tested

Rust proof finish if required for outdoor installation.

Many different arrangements available including transformer mounting and for incorporation in switchboards with Oil Circuit Breaker Units.



H.V. FUSE SWITCH EQUIPMENT



The following can be fitted if required:

Spare fuse container. Ammeter. Potential indicator. Shunt trip. Earth Leakage trip. Earthing and/or testing device for Fuse Switch. Metering Unit with Voltage and current transformers.

Leaflets Nos. 555 and 556 available to bona-fide applicants.

Switchgear by STATTER

Specialists in Switchgear for over 50 Years

J. G. STATTER & CO. LTD

82 VICTORIA ST LONDON SW1

The strange case of the varnished nylon

On reflection, I submit, not so strange as one would think. This young lady is about to leave for equatorial Africa where, as I understand, the Varnished Nylon manufactured by our good friend Symons is particularly trustworthy. Indeed, under tropical conditions anywhere it combines mechanical strength with excellent electrical properties. It has, you will observe, two very notable features. First, it is unique in that as a straight cut tape it is sufficiently extensible to replace bias cut tape in many applications. Second, it has a far higher insulation resistance under humid conditions than any other varnished fabric. A pretty case and a pretty client, if I may say so.

VARNISHED NYLON

Available in both Yellow and Black qualities. Manufactured in 4, 5 and 6 mil thicknesses, straight or bias cut, in rolls 36″ wide, or as tape, any width (English or Metric measure), with straight, slit or serrated edges.

Symons ADVISORY SERVICE

If you have an electrical insulation problem, send it to us! Our experts will be pleased to advise you.

TESTED FLEXIBLE INSULATION BY

H. D. Symons & Co. Ltd.

PARK WORKS · KINGSTON HILL · SURREY

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AH! THAT REMINDS ME

Hoots mon! his bagpipes have burst, and now the highland music is stopped. If you have a riveting problem don't stop and worry—don't take either the high road or the low road, but the road to our technicians, who will be pleased to tell you about the "Pop" method of riveting, how riveting is possible in places inaccessible by other methods and why only one operator and one operation are necessary.

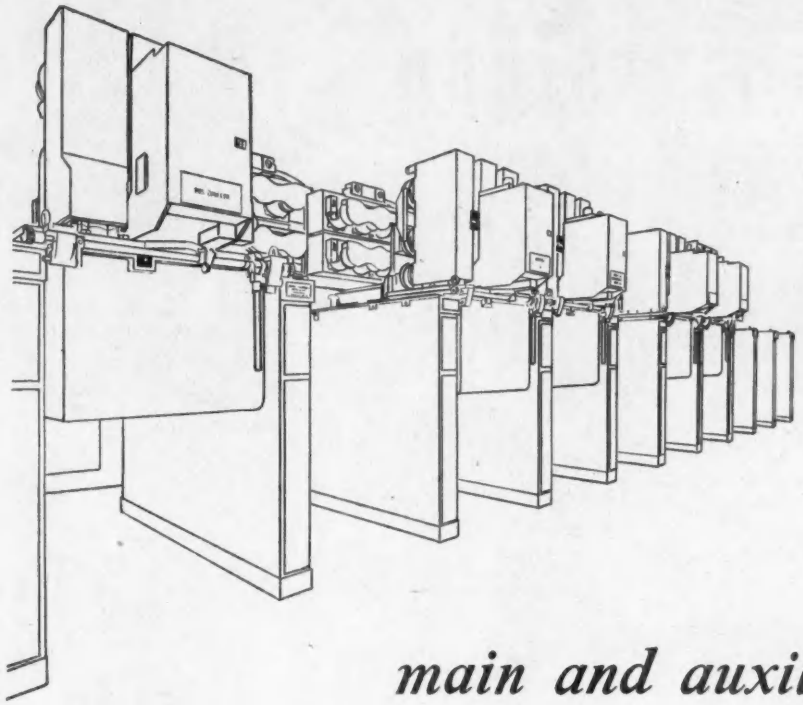
"Pop" is a Registered Trade Mark of the manufacturers

ONE OPERATOR OPERATION

Geo. TUCKER EYELET Co. Ltd. Walsall Road, BIRMINGHAM, 22

CONSULTANTS AND TOOL MANUFACTURERS: **AIRCRAFT MATERIALS LTD.**, MIDLAND ROAD, LONDON, N.W.1

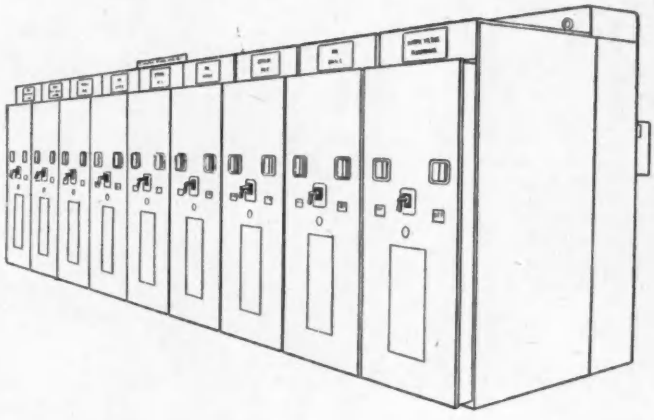
THE MODERN SYSTEM OF RIVETING



33-kV oil-break metalclad main switchgear at Bold power-station

main and auxiliary switchgear for power-stations

One of the 3-kV air-break station auxiliary switchboards at Barking "C" power-station



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MESSRS. MERZ AND McLELLAN

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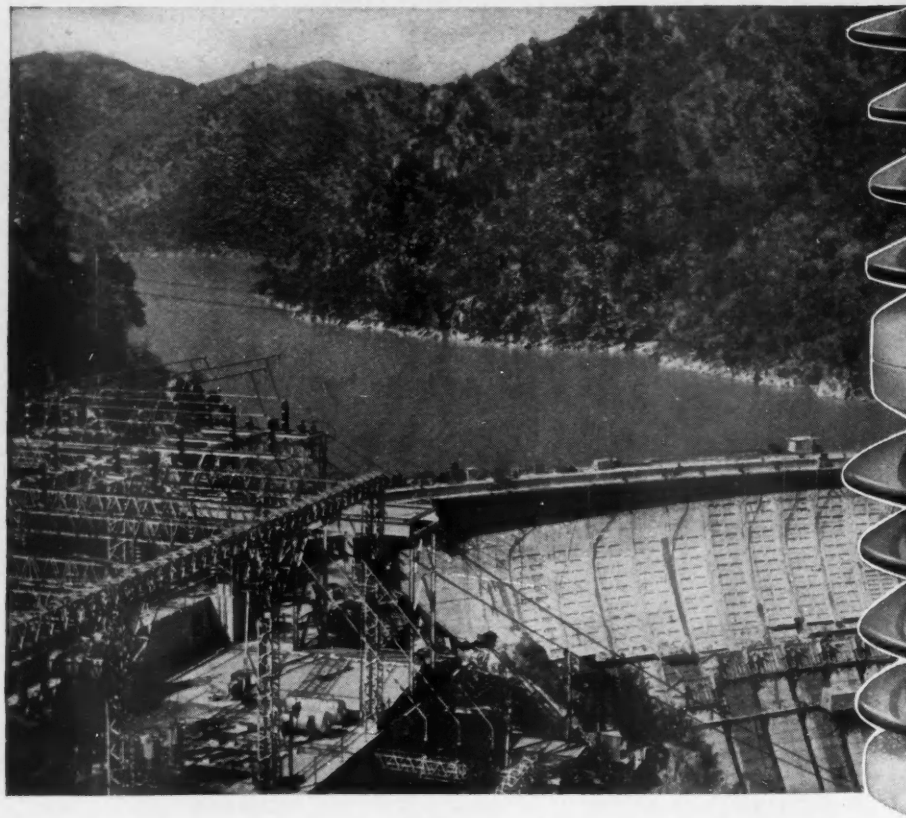
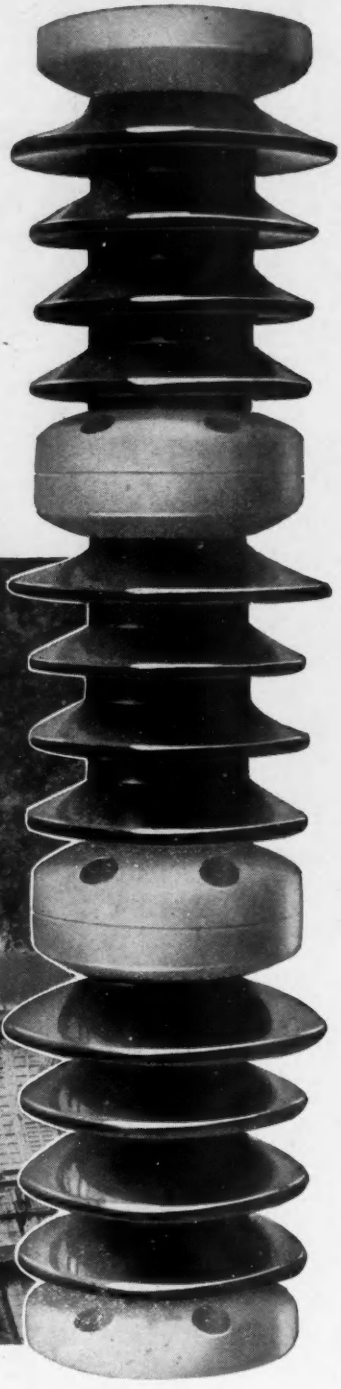
S.P.P. INSULATORS IN SERVICE

Cylindrical Post Insulators in New South Wales





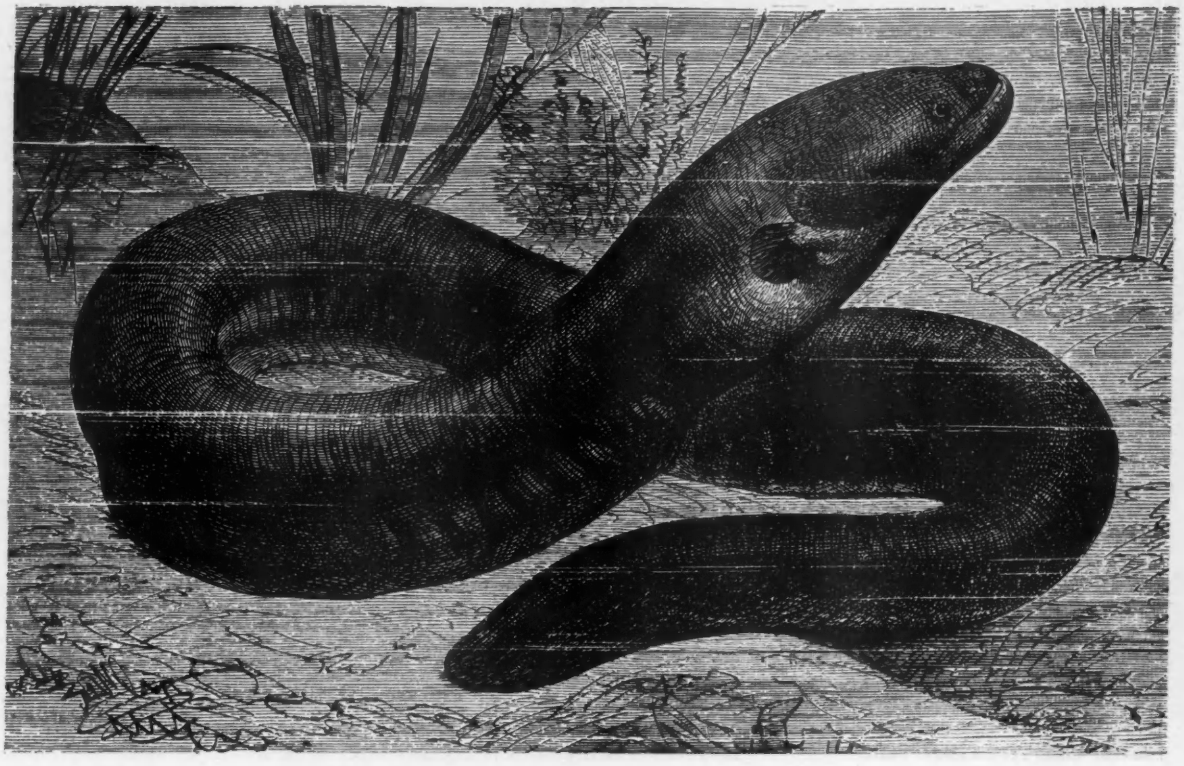
The Burrinjuck 132 kV. switching station was equipped with Cylindrical Post Insulators type P.703. This is one of many stations on the New South Wales Public Works Department system equipped throughout with S.P.P. Post Insulators for 132 kV., 110 kV. and 66 kV.

STEATITE & PORCELAIN PRODUCTS LTD.

Stourport-on-Severn, Worcestershire. Telephone: Stourport 111. Telegrams: Steatain, Stourport

SP.81

How much electricity in an eel's tail?



IN OUR SEVENTY-FIVE YEARS of electrical experience, that is something we have never been asked to measure, which, when we come to think of it, is a little surprising. For every day we are called upon to supply equipment for measuring, generating or utilising electrical energy. And the many users of our products have found that there is a certain additional quality about them which is beyond all measure. That's what we were hinting at when we referred to seventy-five years. Like the eel, we've got a lot of electricity behind us.

You are invited to visit us at the British Electrical Power Convention Stand No. 7

When it comes to electrical equipment . . . you've got to hand it to

Crompton Parkinson LIMITED

ELECTRICAL EQUIPMENT

NOTE: Curiously enough, the electric eel (Gymnotus Electricus) is actually a fish. It gives a greater shock than any of the other fishes endowed with electric power. Its electric organs are situated on the back of the tail and along the base and sides of the anal fin. They are capable of giving shocks sufficient to kill other fish and small mammals.

MAKERS OF ELECTRIC MOTORS OF ALL KINDS · ALTERNATORS
GENERATORS · SWITCHGEAR · B.E.T. TRANSFORMERS · CABLES
INSTRUMENTS · LAMPS · LIGHTING EQUIPMENT · BATTERIES
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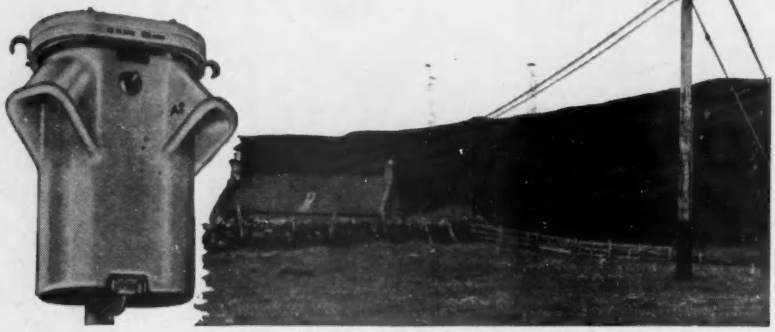
British Power Transformers

for rural distribution

in hermetically-sealed stoneware containers



Photograph by courtesy of British Insulated Callender's Construction Co. Ltd. and the North of Scotland Hydro-Electric Board.

- No maintenance costs. Containers are salt and acid proof. Supporting steel work is heavily galvanised. Hermetically sealed container protects oil from acidity.
- Increased efficiency and reduced operating costs due to low losses.
- High Overload Capacity.
- Simple installation—only one or two bolts required. Other types of distribution transformers, including units to the Draft National Standard Specification T.1. in steel tanks, can also be supplied.

BRITISH POWER

BRITISH POWER TRANSFORMER CO. LTD.

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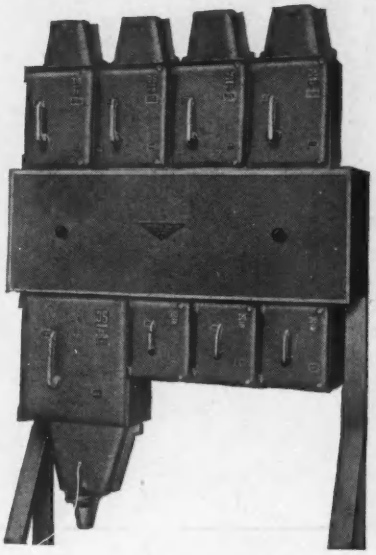

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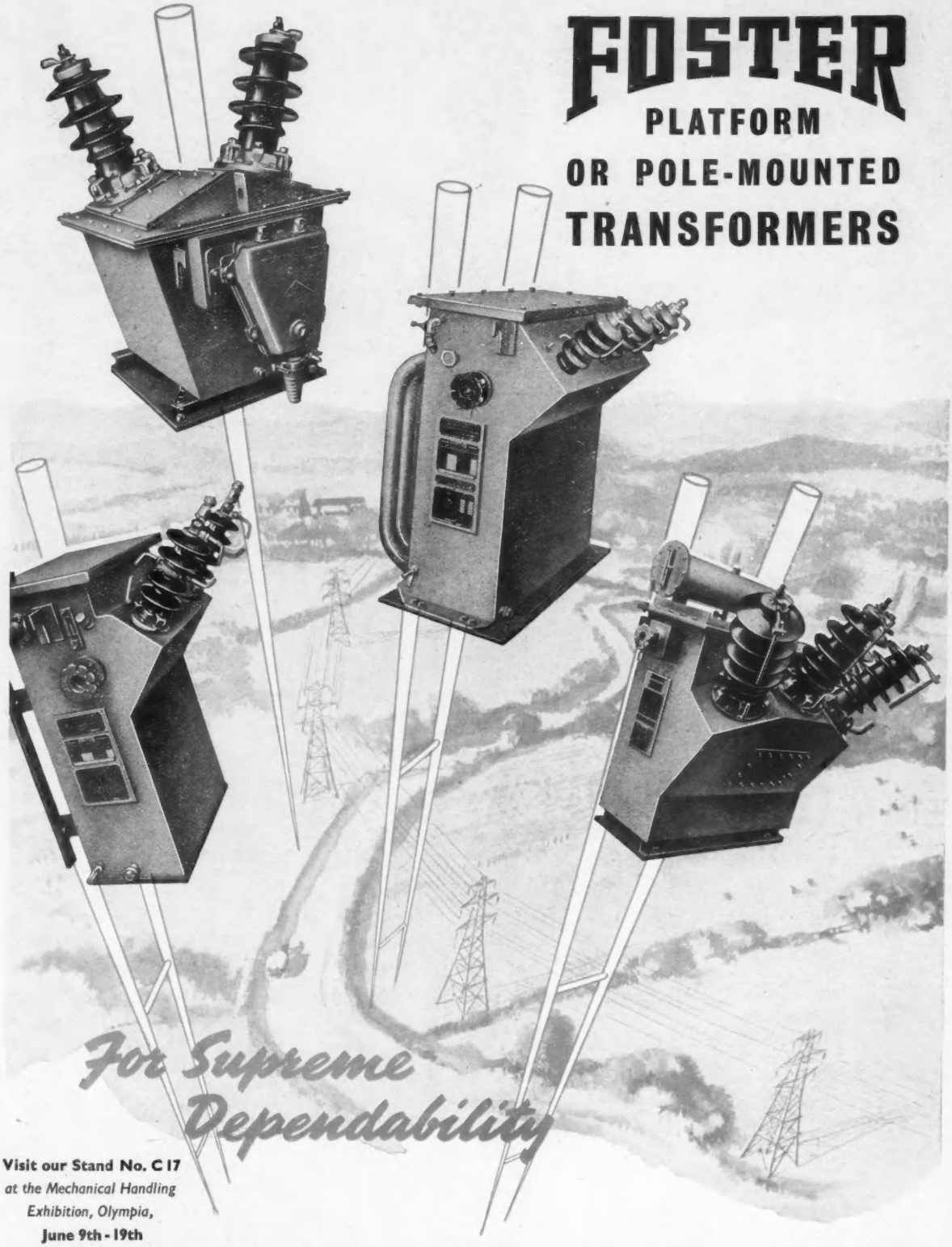

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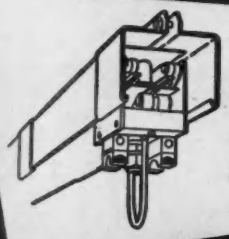

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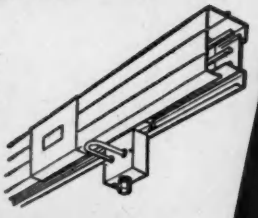

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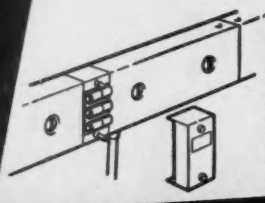

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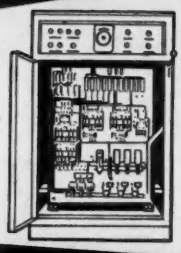

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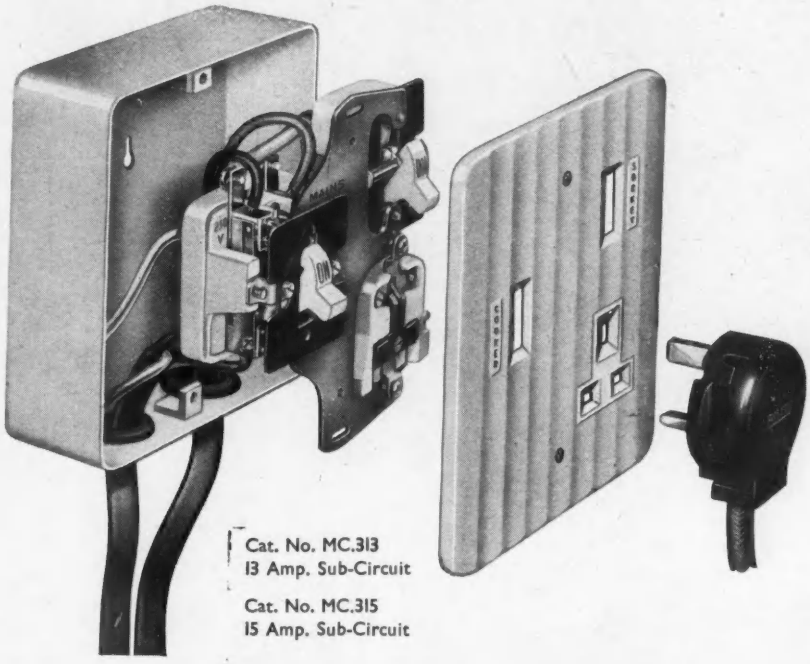

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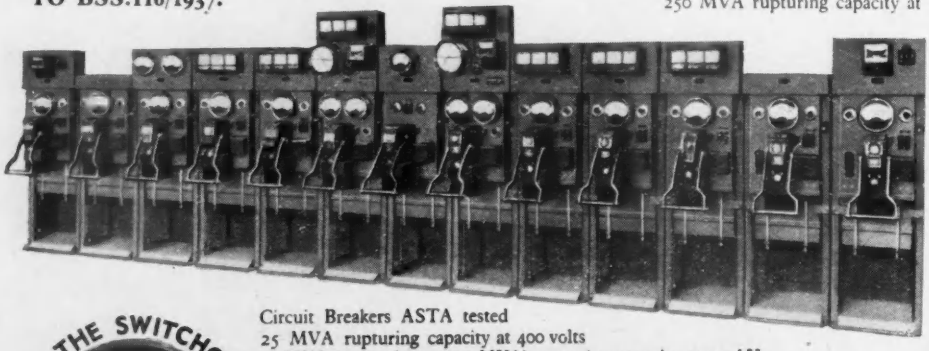

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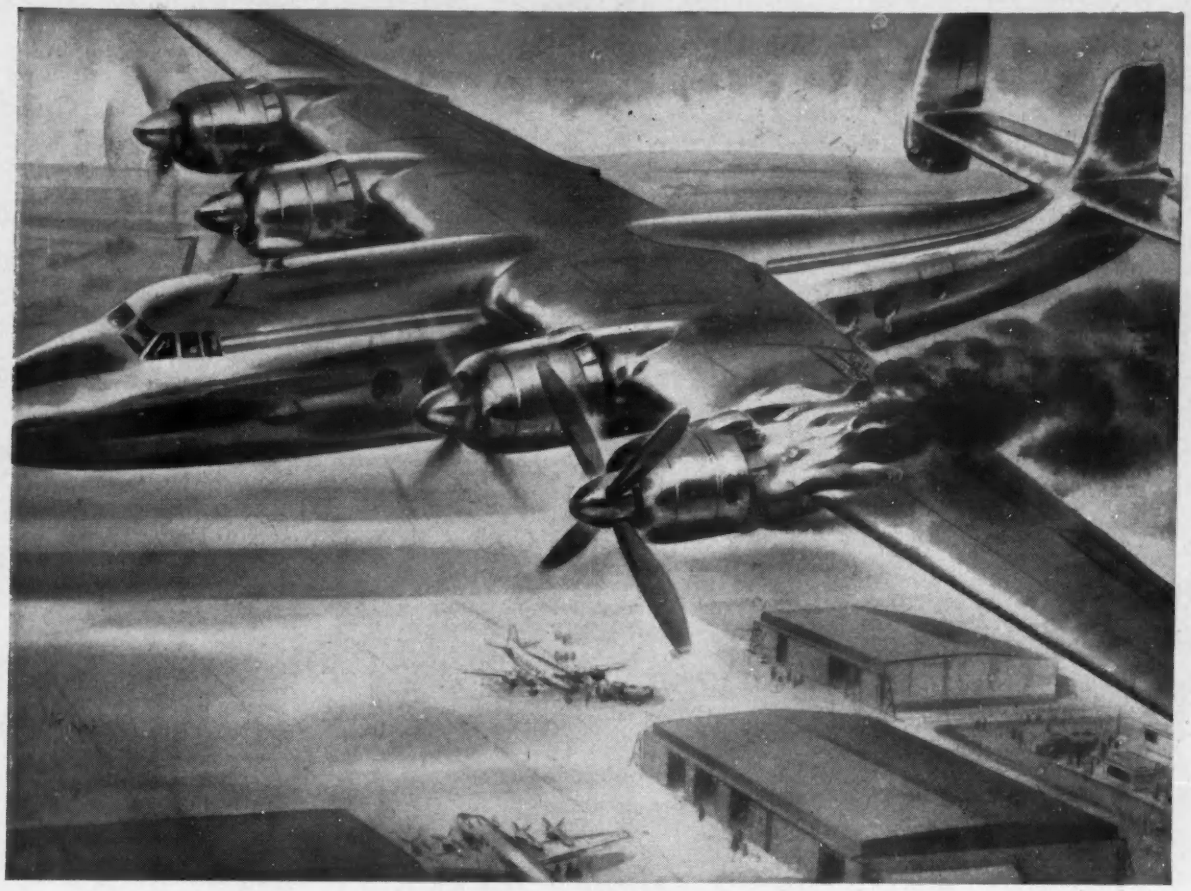

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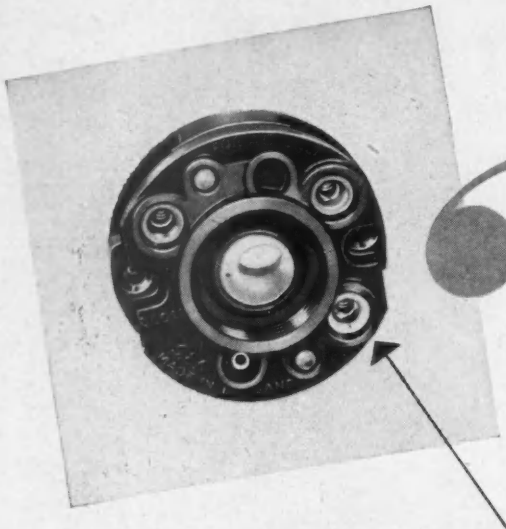

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ELECTRICAL TIMES

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In This Issue

Hydro Power in Iceland 889
Consultative Councils, by *Alderman W. J. Bennett*, C.B.E., J.P. 892
Weather and the Load Curve, by *G. Spurr*, B.SC., F.R.MET.S. 894
Are We Shy about Electricity? *By a Contributor* 897
N.A.L.G.O. Salaries Warning 898
Substation Design in Seeboard 899
Readers' Views 902
The Barton Explosion 903
British Electrical Power Convention 904
Lord Citrine Comments 911
Woodhead Tunnel Opened 911
Faults on a Distribution System by *T. Smith*, A.M.I.E.E. 912
Electric Drive for a Finishing Mill 919
Notes on Wiring, by *Megohm* 920
Sir Charles Parsons 921
Overseas News 922
Personalities in the Industry 924
New Literature 925
In the Honours List 926
Problems and Practice in Engineering ... 927
Equipment for Industry 928
For the Electrical Trade 929
News of the Week 930
Company Activities 934
Electric Supply News 935
Commercial Information 936
Classified Advertisements 79
Index to Advertisers 86

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THEME SONGS

The theme for this year's power convention is no less a subject than "the promotion of electrical development at home and overseas." Under such a banner one can span the whole realm of electricity without placing a foot beyond the boundary line. In fact this year the theme is so wide as hardly to be a theme at all. And, if anyone reads into the word "promotion," a hint of possible discussion on promotional activity, they are likely to be disappointed. The export side of the theme is mainly represented by Sir George Nelson's paper, with the President discussing the role of consulting engineer overseas. Electrical development is ably represented by Mr Bellamy while the other papers, excellent though they are in themselves, reveal the authors' struggle to bring their subjects, in some part, to within the set formula. This picture, familiar at other conventions, raises the question whether we have been deluding ourselves too long in the necessity for a theme. That first most successful B.E.P.C. at Torquay which nurtured the 275 kV grid, had an able combination of theme song and supporting papers, technical in presentation and topical in approach. Such a standard has never been equalled and only approached once, in the domestic electrification papers at Bournemouth. Perhaps then the excellence of the inaugural convention is the reason that has set us seeking to attach some label to each of our annual meetings. But is such a label necessary? We got on quite well without one before and in the even wider diversity of representation that now attends the convention, should we not aim at providing, at least in part, a similar diversity in the programme. If a theme is to be strictly adhered to, then it inevitably means a lapse of some six or seven years before it is possible to return to a particular subject, a period too long for our current rate of development. Further, in any year one or more sections of the delegates will find no technical interest in the papers and it is for this very reason that in practice the programmes have shown such marked deviation from the lines officially laid down. Let us then have no more of themes: they are beginning to wear thin anyway. Instead the aim should be to produce a well balanced programme of technical and sales interests with perhaps a presidential address to provide a sounding board for the industry's views to reach a wider public. Only then can the convention be honest with itself and face up to the true task it has to play.

DISTRIBUTION STILL SECOND

It is common knowledge that since vesting day the area boards have had to make do and mend on their distribution

systems. In an economy short of capital, the principal share of what money became available for investment in the industry was expanded on the provision of urgently needed additional generating capacity. The natural corollary is that with the worst difficulties of generating plant shortage overcome, there will be added attention to the deferred requirements of distribution system extension and reinforcement. Indeed, the chairman of one famous electrical company suggested to his annual general meeting recently that ". . . fairly soon . . . priority will have to be given to bringing the public distribution systems up to date." It is surprising then, to find amongst the official statistics issued in support of the Bill to increase the B.E.A.'s borrowing powers, an estimate for expenditure on distribution during the seven years from April 1953, which is less in proportion to expenditure on generation equipment than the total spent during the first five years of nationalisation. The actual ratio of distribution to generation expenditure for the two periods are 79% and 71% respectively, but it must be assumed that the £527m allocated for spending on distribution during the seven-year period includes provision for the promised increased investment in rural electrification. The answer to this paradox probably lies in the better use to which distribution copper is now put. To quote a recent B.E.A. statement ". . . present day loading standards are now appreciably higher than pre-war . . . it is now normal practice not to reinforce unless apparatus is carrying, or is likely to have to carry, about 30% in excess of its normal rating." In other words, the present is living on the greater caution which was necessary in the earlier days of supply engineering. But such a phase cannot persist for ever, and in the long run, the expectation of priority attention to distribution is likely to be justified.

EVIDENCE ON EARTHING

What method of earthing to adopt on a distribution system is a question which has formed the subject of many electrical engineering discussions. The textbooks hold forth at some length on the advantages and drawbacks of the alternatives available, while every supply engineer has a fund of experience that colours his own preferences in the matter. In the main, though, discussions and decisions turn on impressions gained on widely different supply systems where many factors besides the type of earth connection used have an influence. To separate evidence strictly relating to earthing from such general impressions is no easy task, but it is one of the many valuable features of the comprehensive fault reporting system of the Eastern Electricity Board that it permits this to be done. The comparison of systems which are earthed solidly or through a resistance, on the one hand, or via an arc suppression coil, on the other, is perhaps the most interesting feature of the article we publish this week describing the first two years of operation of this project. There is no doubt that the evidence in favour of arc suppression coils, at least at 11 kV, is convincing; for most types of faults the incidence in terms of faults per 100 miles per year is significantly lower than with solid or resistance earthing. It is partly on the basis of this evidence that the Eastern Board is extending its use of arc suppression coils: in a few years time the same methodical fault analysis, extended in certainty by a growing number of statistics, will provide the best available assessment of the benefits or otherwise obtained from the change.

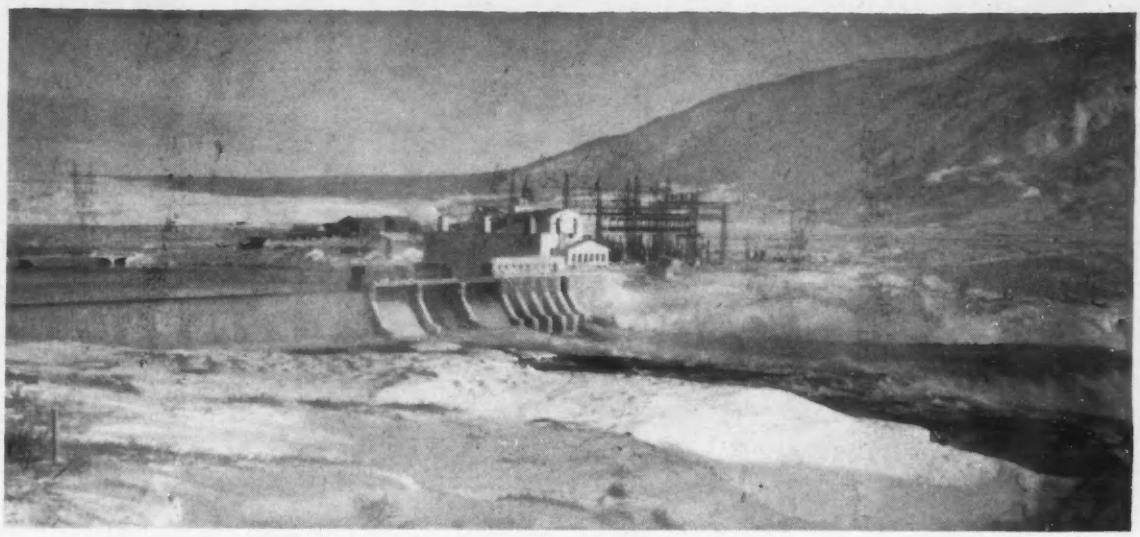
MR COOPER ANSWERS

An experiment in employer/employee relationship is being tried out in the N.W. and Merseyside division which although not novel in concept is new to nationalised industry. Every employee is invited to send to Mr Cooper, the divisional controller, questions concerning aspects of organisation and the first batch of queries and answers has now been published in the divisional magazine. Not unexpectedly, a substantial proportion of the questions concern conditions of work, which is suggestive that joint consultation is not working as well as it should. Other questions cover a range of subjects from forward planning to suggestions for improvements. The merit of the scheme lies in the provision of a direct channel of communication between the employee and the head of the undertaking providing thereby that sense of personal touch which is so difficult to create in a large organisation. The scheme is not without its dangers, however. The short circuiting of committees may save time, but is liable to be frustrating to those on the committee, while the ability to appeal direct to the chief can have repercussions amongst the intermediate executive staff. No doubt these possibilities have been foreseen and suitable safeguards introduced. Certainly from the evidence of the published answers there is little indication of such troubles and no doubt when the first flush of questions has passed, there should be much to learn from this experiment in management technique.

A GREAT ENGINEER

Few men have been blessed with the remarkable combination of intuitive and scientific knowledge possessed by Sir Charles Parsons, the anniversary of whose birth fell last Sunday. His inventive capacity was wide, embracing many differing branches of science and engineering; his courage in the face of difficulties was unbounded, and his confidence in his own capabilities and those of his associates was a continuous source of inspiration to the employees in his works. Indeed, so prolific was his brain that at one time the rate of improvement of successive turbo-alternators seemed likely to prove an economic embarrassment to his firm. But above all was his intense curiosity as to the why and wherefore of things, a curiosity which led him to explore such diverse problems as accuracy of gear cutting, production of large parabolic mirrors, cavitation erosion of marine propellers, the possibility of powered flight and the manufacture of diamonds. Yet despite these excursions he was never diverted from his main object, the development and improvement of the compound steam turbine, on which it may truly be said that our industrial civilisation depends. For this work alone, Parsons has established his right to be regarded as in the forefront of British engineers. His monument lies all around; on land; in the ocean, and due to his work on axial compressors, even in the air. Surely no engineer has yet lived to see so great a sociological and industrial change in the world caused by his own inventions.

Meteor



Hydro Power in Iceland

UNDERGROUND STATION FORMS PART OF RIVER SOG DEVELOPMENT

IN the south-western corner of Iceland the River Sog flows from the 33 sq mile Lake Thingvallavatn to the glacier river Hvita. In its course it falls through some 251 ft. The hydro-electric power which this represents is being harnessed in three generating stations, which when fully developed will provide the south-western peninsular of the country and the capital Reykjavik with 96 MW of power.

From its source, the river flows only a short distance before a smaller lake, Ulfljotsvatn is reached, but it drops 70 ft in this progress. Three separate waterfalls, Sogsfossar, follow, giving the balance of the hydraulic head. Economic development demands one station between the lakes, another (Ljosafoss) at the outlet from the lower lake, utilising the first waterfall, and finally a third station, Irafoss making use of the 124 ft head of the lower falls.

The River Sog has an average flow of 4,000 cusec, and is exceptionally uniform in this respect throughout the year. The building of dams makes some regulation possible, and in all three power stations the maximum output of plant is based on 5,200 cusec. Measured flow has been found to vary from 25% below to 50% above average. The annual production estimates of the scheme are based on 80% of average flow. The drainage area is around 320 square miles.

An Underground Station

It was as long ago as 1935 that a start was made on the Sog development, two 4·4 MW units being erected at Ljosafoss between then and 1937. Later, in 1944, a 5·5 MW set was commissioned, and since then the station has been operating with a maximum output of 16 MW and an annual production of about 100 million kWh. The next station to come into operation was Irafoss, which was built between 1950 and 1953. In this first stage of development, two 15·5 MW units were erected, and space was provided for a third similar unit. The ultimate annual production is estimated at 240 million kWh. Irafoss power station is an interesting example of underground construc-

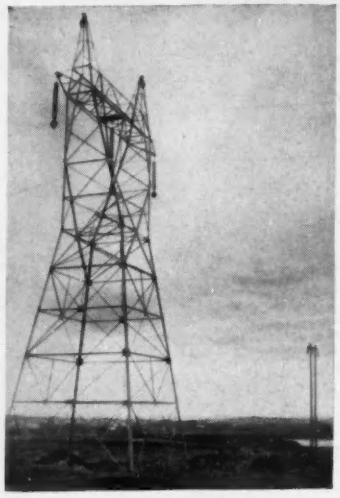
Winter conditions in Iceland are severe as seen in this general view of the Irafoss station last year. The form of the dam is clearly shown while in the background is the switching station. Below is a picture of the spiral casing of a turbine during erection

tion, and most of the remainder of this article will be devoted to it.

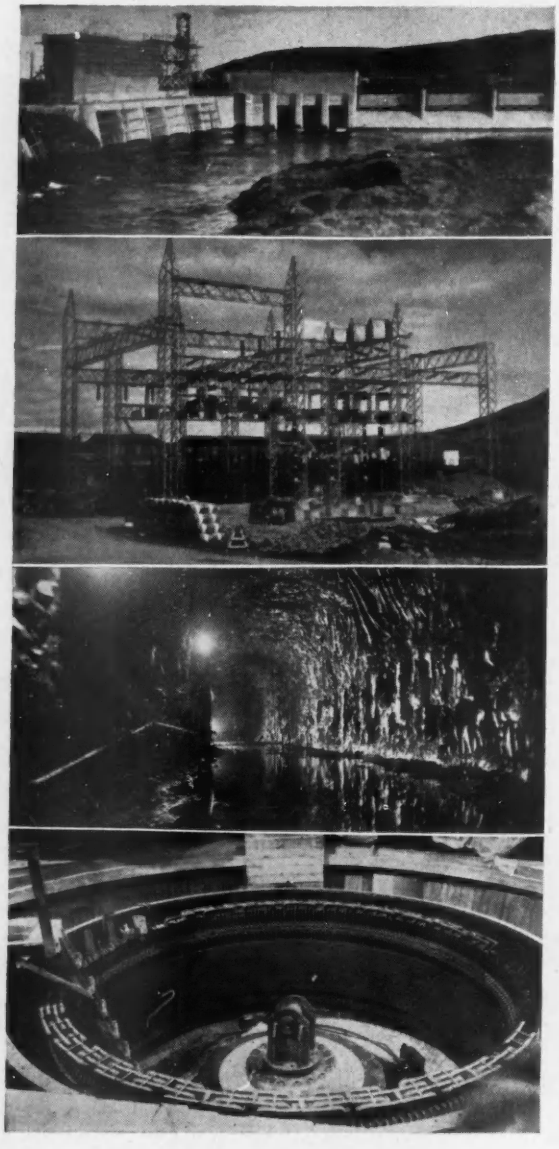
The station generating chamber is some 85 ft below ground level, being placed a short distance to the east of the river bed at the upper water level. It is blasted out of basalt lava, tuff, and moraine formations, lined with concrete, and provided with a reinforced concrete vault above the generating chamber roof, as a means of rock support. Walls above the turbine floor are self-supporting, with a space between the rock and the walls. The walls support a 75-ton travelling crane, which services the 137 ft by 40 ft machine room.

Vertical shaft Francis-type turbines are used, with a speed of 187·5 r.p.m. Each is rated at 22,000 h.p., and is directly coupled to its alternator. Oil-pressure servo motors mounted on the turbine floor control the governors, which are operated by electric motors fed from a special transformer. The main generators mounted on a floor above the turbines, are rated for an output of 19·375 MVA at 0·8 p.f., and generate at 10·5 kV, 3-phase, 50 c/s. Short-circuit ratio is 1·0. A concrete housing is provided around each stator.

In the foreground of this view is a typical 132 kV line tower while beyond it is seen a wood pole 60 kV line



Top to bottom. (a) The Eastern end of the Irafoss station with construction well advanced in the spring of 1953. The taintor gates bottom sluices and intakes are clearly seen. (b) the outdoor switching station controlling the 132 kV line to Reykjavik. (c) the tailrace tunnel being driven through basalt and (d) the generator stator assembled on site



Current transformers and earthing equipment are provided on the generator floor. Flush with the coverplate of the generator, another floor is built, giving access to the main and pilot exciters. This is the machine room floor.

Two cables per phase run from the generators in fibre ducts on the turbine floor. They ascend in a vertical shaft at the northern end of the power house, along with control cables and necessary pipework, and emerge at ground floor level of the main above-ground building, where 11 kV metalclad switchgear is connected. From this switchgear is fed an outdoor 132 kV transformer switching station, the first step in the 32-mile long transmission link with the Icelandic capital, Reykjavik. Instrumentation is provided on the second floor of the switchgear building.

In addition to the cable shaft, there are several other outlets from the power house to the surface. These comprise a transport shaft for large machine parts, a lift and staircase, and a ventilator duct which leads to the roof of the control building. This ventilation duct has a second purpose: it is connected to the tailrace vault and tunnel, and provides a means of compensating air pressure variations caused by sudden load changes.

Civil Works

At the Irafoss station, the Sog is held back by a reinforced concrete curtain dam, pillars on 17 ft centres providing the main support. The dam is 540 ft long, and it rises to a maximum height of 43 ft. It has the effect of raising the water to the level of the tailrace at the preceding Ljosafoss station, which is half a mile further up the river. The dam is provided with three taintor gates, 6 by 32·5 ft and three 13 by 10 ft bottom sluices. An ice sluice is provided, and there is a free level overflow over the dam crest of 225 ft.

On the west side of the river there is a short earth-filled dam with a reinforced concrete wall in the centre, and this connects with the west river bank. At the east side the dam connects with the intake structure through a supporting wall. The intake structure is placed almost at right angles to the dam axis along the east side of the river

Two of the waterfalls of the River Sog are seen in this view. They are the Kistufoss and Irafoss in the background to the left just below the power station. In the foreground is the mouth of the tailrace tunnel

bed. Gate hoists are housed on top of the dam and the intake works.

Three intake openings are provided, each protected by an electrically-heated trashrack. The openings are each dimensioned for a flow of 1,720 cusec, and they lead the water down to three circular pressure penstocks of 16·5 ft diameter which are embedded in the rock. These penstocks slope down at an angle of 60°, and at the lower end lead into the spiral casing of the turbines. At the lower end they are lined with reinforced concrete and steel tubing.

On leaving the turbines, the water flows away through draught tubes into an underground tailrace vault, and from there into a free level tailrace tunnel. The length of this tunnel is 2,100 ft, and it has a cross section of 550 sq ft. It discharges eventually into a 260 ft long canal which leads to the river bed. At one point the tailrace tunnel crosses under the river, the rock cover at this point being about 46 ft thick.

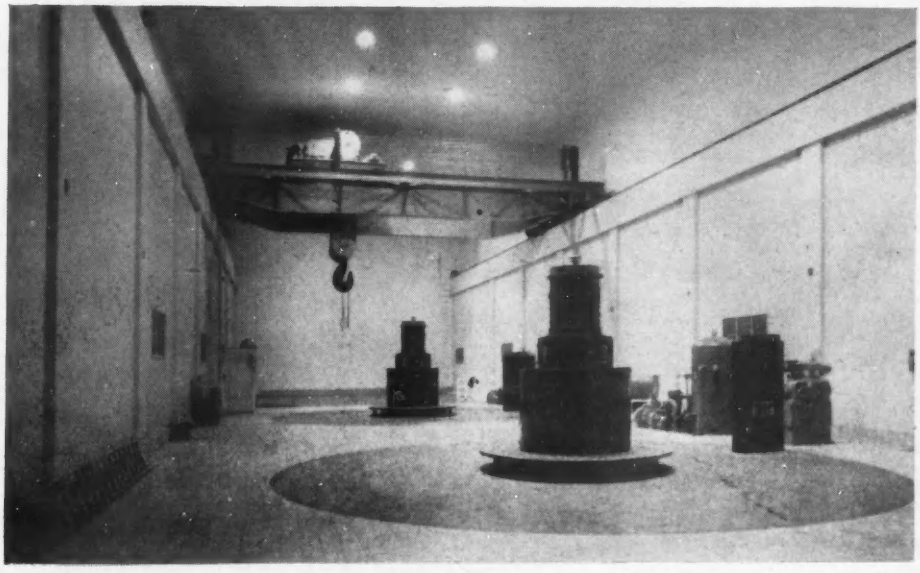
The tunnel is blasted through the same types of rock which were mentioned in connection with the power station, and it was driven to an unlined cross section of 680 sq ft. The 2,100 ft length took 12 months to drive, and very little trouble was experienced. No support was needed for the roof prior to lining. Altogether some three million cu ft of rock were blasted, and 550,000 cu ft of earth were moved in constructing the station.

From the outdoor switching station, which has been described above, a 60 kV line provides an interconnection with the nearby Ljosafoss station. A 15 MVA transformer is incorporated in the link.

The main transmission line to Reykjavik is carried on steel towers, with steel-cored aluminium cables arranged in horizontal formation. 11 unit suspension insulators are used. Earth wires are run above the lines only for the first three miles outside terminal stations. Each tower is well earthed through a system of rods and cables buried to beneath the frost level—a reminder of the conditions under which the Sog development operates. The capacity of the line is 96 MW.

At Reykjavik, the line terminates in a transformer station stepping the voltage down to 34·5 kV, which is the primary distribution voltage for the town network and for the Reykjanes peninsular which it supplies.

We are indebted to Sogsvirkjunin (the Hydro-Electric Development of Sog) for providing the information on which this article is based, and also the illustrations.



The underground power house at the machine floor level when the station is fully developed

CONSULTATIVE COUNCILS

— An examination of their progress during their first five years

*by Alderman W. J. Bennett, C.B.E., J.P.**

IT is now five years since the Consultative Councils set up under the Electricity Act for the nationalised electricity industry started operations and the time is opportune to review their achievements and attempt to estimate their future value. In assessing what has been accomplished, it is important to have a clear understanding of what was attempted. The Councils were an experiment, and a most courageous experiment, in the maligned craft of public relations. The Councils, lay bodies attached to highly technical industries, were not assigned the role of sharpshooters, entrenched in strategical positions, and charged with the duty of mowing down the new Boards immediately it appeared they were not growing up in the way that the public desired that they should. Neither were they to be apologists for the nationalised industries, a kind of second line of defence which would be exceedingly difficult for disgruntled consumers to storm. They were to act in concert with the Boards and the public and to gain the confidence of both, if that were possible. They were to consult and try to find solutions to problems; their function was not to criticise and tear down.

Five Years Work

My own Council, the Eastern Electricity Consultative Council, held its first meeting in January 1949 and since then has held bi-monthly meetings in public and its six local committees have held a similar number of meetings in private. At the meetings of the Council, matters of principle affecting the distribution of electricity and the price charged have been considered, while the local committees, generally, have concerned themselves with representations from individual consumers. During the course of five years the members of the Council and of the committees have gained a considerable knowledge of the problems affecting the distribution of electricity and, while they can only be described as well-informed laymen, they have, either by virtue of their local government experience or long membership of organisations concerned with industry, commerce or labour, been able to bring to the questions presented for their consideration, good judgment, and, I think, sound common sense. In many cases, the person making the representation to the Council has benefited by a change of decision on the part of the Board concerned; a supply promised in the distant future has been expedited or a grievance concerning a tariff has been satisfied. In other cases, and it must be admitted that these are in the majority, the Board has satisfied the Council that the action which they have taken in some particular case has been fair and reasonable. There has also been considerable consultation between the Board and the Council and such matters as the new methods of charge, which all boards were required to produce in substitution for the many and varied tariffs operating prior to Vesting Day, were dealt with in this way. As a result of such consultation anomalies and perhaps injustices were removed from the proposals of the boards.

Generally, a great deal of worthwhile work has been accomplished; that it has not brought laurel wreaths to the shoulders of the Councils should not cause dismay or undue pessimism as to the future of the Councils. The local government of this country is carried on very efficiently with a minimum of praise and a maximum of brickbats. Consultative Councils will not expect any more favourable treatment.

Have the Councils come to stay? I think they have. They will, or should, continue to exist because they have done and are doing valuable work and also because they were made, from the start, an integral part of the industry with which they were associated. The idea of consumers' councils is not new. America gave them at trial in the thirties and decided that either they did not work or that they worked too well from the consumers' point of view. The fault, in America's case, I believe, was the almost complete divorcement of the councils from the industries with which they were supposed to be linked. No such error was committed in the British Acts which brought Consultative Councils into being. It was made clear, even during the debate in the Parliamentary Committee prior to the passing of the Act, that the new Councils were to be much more than the representatives of the consumers in a very narrow field. Mr Shinwell, during the discussion in the House of Commons' Standing Committee on 13th March, 1947, said there was a substantial difference between consumers' councils which concerned themselves solely with the interests of the consumers in respect of price, supplies and quality, and the proposed consultative councils. The latter would be endowed with powers, and would be required to undertake activities, far wider than those of the consumers' councils. They would, in fact, as was later set out very clearly in the Act, be given the duty of "considering any matter affecting the distribution of electricity . . . and of considering and reporting to the Area Board on any such matter which might be referred to them by that Board."

There is, therefore, a wide divergence between the duties assigned to the consumers councils under the Coal Act and those with which the Gas and Electricity Consultative Councils were charged. To quote Mr Shinwell again, the new councils would have to enter into consultation or into what might be regarded as a full-fledged partnership with the Area Boards. The Chairman would be a member of the Area Board and in that way there would be established a very effective liaison between the two bodies.

"It is," said Mr Shinwell, "an entirely new conception."

Considering Representations

Examine, for a moment, the procedure by which representations from consumers are considered. In the first place, it is essential that, before an appeal is made to a council, the machinery of the Board should be used to the full. That is, the consumer should first lay his complaint officially before the Board and only when that avenue of approach becomes impassable, should the consultative council become involved. The council, on receipt of a letter from a consumer, asks for the board's observation upon the complaint and the matter is then referred

**Alderman Bennett is Chairman of the Eastern Electricity Consultative Council.*

to one of the local committees, according to the area from which it derives, or should there be a matter of principle involved, to the full council. Under the standing orders of the council, the complainant may, if he wishes, present his case in person either to the local committee or to the council, in which case the board must also be invited to be present. In passing I should say that I have found it has not been the practice of the boards to accept such invitations; the councils are not legal tribunals and it might not be wise—it certainly would be undignified—for a senior official of a nationalised industry to be placed in a position where he could be cross-examined by laymen upon his board's policy. After consideration of the representation, the findings of the council are made known to the board. These findings are recommendations only, for the council has no executive power, and rightly so, since it is not a shadow board, to enforce their adoption. In most cases, however, where my own council has suggested a modification or alteration of what the board has proposed to do, those suggestions have been accepted, a tribute to the sweet reasonableness with which modern business, increasingly, is run.

A great deal of the most valuable work of the council, as I have said, has been done in consultation with the board and I would instance the introduction of the new standard tariffs for electricity. In my own council's case, and I think it best to illustrate my arguments by chapter and verse of a story of which I have helped in the writing, a special tariffs sub-committee was set up to consider the board's proposals for these tariffs. As members of that committee there were industrialists, local authority members and persons whose chief interest was the domestic consumer. The committee met the officers of the board over a period of two days and discussed the proposed standard tariffs line by line. As a result of this discussion, some modifications were made and when the tariffs were eventually published they had the approval if not the blessing of the council. On reflection, I still think that the modifications suggested by the council were wise although in one instance, I am now inclined to believe they were in error. I mention this merely to show that consultative councils can be wrong in company or in disagreement with their boards.

Weakness and Strength

It is only to be expected that over a period of five years, consultative councils should have made clear their weaknesses and their strength. Their work has also thrown into sharp relief the weaknesses of the Act which brought them into being. I must speak of one weakness which in importance, in my opinion and in the opinion of many of my council, transcend all others. Electricity boards are only responsible for the distribution of electricity. The British Electricity Authority is responsible for the generation of electricity. There is a consultative council for each of the fourteen area boards but there is no similar organisation for the British Electricity Authority. As the boards must buy their electricity from the British Electricity Authority, it follows that the price which they have to pay for it is the principal factor in the price which must be charged to the consumers, yet there can be no consultation with the Authority upon the composition of that bulk supply tariff. No consultative council is competent to question what the Authority decides to charge and, therefore, I contend that the councils are seriously handicapped in the proper discharge of their functions.

Consultative councils are staffed by officers seconded from the parent board. At the most, two officers, one part-time and one full-time, with a typist, are all that is needed. The councils, do not, in themselves, offer a career and it is essential that their employees should have the advantages of the board's superannuation scheme and conditions of employment; it is also essential that they should have, or should acquire, a reasonable knowledge of the operations of the electricity supply industry. There has been some criticism of this method of staffing the councils but I do not think that any other system would have been successful. I have not heard of a consultative council officer who has become confused in his loyalties and it is as essential for the staff, as for the council, to be in a position to consult with the board's staff.

What do consultative councils cost? The accounts of the British Electricity Authority for 1952/3 gives the total costs for all electricity consultative councils as £31,216, an increase over the previous year of £2,371. This includes the salaries of the staff (payment is made by the respective boards who recover the amount from B.E.A.), and travelling expenses of members and staff; the cost of accommodation for meetings is borne by the boards. The average cost, therefore, is something over two thousand pounds a year which does not seem excessive.

The Future

What will be the future of consultative councils as far as other industries are concerned? They would only be able to operate successfully with nationalised industries, unless private enterprise could be induced to accept them as part of their normal existence, which I doubt. The life blood of the councils is not the representation from consumers but the information received from the boards. Closed lips on the part of the management could stultify every effort made by the council. From experience of my own council, I deduce two facts. Firstly, that a consultative council can only work satisfactorily with industries or with trades, the product of which is absolutely essential to the consuming public. Were farming and the food distributive trades nationalised, a consultative council would, I contend, be essential to the well-being of the public. Secondly, as I have already indicated, no consultative council can operate successfully unless it is accepted by the industry concerned.

To conclude on a lighter note. The secretary of my council had been corresponding for some time with a consumer whose representation had been considered by the council. The council's findings, which approved the board's action, had been communicated to the complainant but the correspondence still continued. Finally, the aggrieved consumer wrote to the secretary saying that he had been informed that there was a consumers' council for dealing with complaints such as his and why had he not been informed of its existence!

The tradition of a name dies hard.

The Industrial Maintenance Supplement, which would normally have appeared in this issue, has, due to pressure on space, been held over. It will, however, be published with our issue of June 24

Weather and the Load Curve

METEOROLOGICAL FACTORS AND ELECTRICITY DEMAND

by G. SPURR, B.Sc., F.R.Met.S.*

THE effect of weather on system load is an important consideration for control engineers and long-term planners alike. The seasonal effect has great bearing on maintenance and development, and the day-to-day variations of weather are the controlling features of the peak period demands.

In an interconnected Grid system, the amount of generating plant in operation or in immediate reserve must follow closely the varying load. Under conditions where the plant available is only sufficient to meet the demand, it is essential to know in advance what the daily peak loads will be, in order that arrangements can be made to minimise the strain on the system. Where the plant available is well in excess of the demand it becomes a question of economy to be able to predict the peak loads.

It has long been realised that the day-to-day variations of peak loads are largely due to the variations in the weather, but it is only during the post-war years that detailed weather information has been made available to control engineers. Past weather information is now used statistically to calculate conversion tables of weather elements into megawatts of load and these tables are applied to weather forecasts to estimate future peak loads.

* *Mr. Spurr is a member of the staff of the B.E.A. Research Laboratories.*

Base Load

There are two ways of looking at the system load. Firstly, it can be regarded as made up of industrial, commercial, traction and domestic loads, the terms being more or less self-explanatory. It may also be regarded as a basic normal load (comprising mainly of industrial and traction load), a variable load which will respond to the changes of weather (mainly domestic and commercial loads), and an occasional smaller load which may be due to various causes such as special wireless or television broadcasts, local holidays, and so on.

It is with the variation due to weather that we are concerned here, but we shall show how the normal load is used as a basis for predicting peak load. In effect, estimates of the system load are obtained by forecasting the weather and giving each element a weighting factor to be applied to a predetermined base load.

The ideal solution to the problem of load analysis would be to divide the load at any time into a base load independent of weather, a heating load arising from the departure of the ambient temperature from an optimum value (say 65° F) and a lighting load making up the deficiency of daylight brought about by the sun's position and the amount of cloud present. Since this would involve an extensive study of daylight illumination and the forecasting

of daylight intensity, an interim measure has been adopted postulating a base load which would occur with the following weather conditions: (*a*) The average temperature for the time of day and year. (*b*) No cloud. (*c*) No wind. Thus, the seasonal variation of the lighting demand due solely to the change in the sun's path is incorporated into the base load, and an attempt is made to predict the variation of load due to the variation of cloud amount.

This adopted base load will vary slowly through the year since it includes a basic lighting demand, and also depends upon the average temperature. It could also vary with load growth and economic fluctuations.

Temperature, Cloud and Wind

There is a high degree of correlation between air temperature and electricity demand and the relationship is very nearly rectilinear. This is to be expected since the heat dissipated from a building is directly proportional to the temperature gradient across the walls. In the region of 40° F, a fall of temperature of 5° F over the whole country could give rise to an increase of 600 MW at peak periods. At temperatures above 65° F, however, further increases have little effect on the demand, and at temperatures below 25° F further falls give rise to little increased demand, since (it is assumed) all available heating equipment is already in commission.

In considering peak load at a definite time, it is fairly evident that a spot reading of temperature at that time will not be particularly relevant. A peak load will be the result of a growth during the short period ahead of peak time and its value will depend on the average temperature for the preceding three or four hours. There is also a time lag in the response of demand to a major change in temperature, for example, the onset of a cold snap. This may be due partly to the retarding effect of well-insulated buildings and partly due to the time taken by the population to appreciate a change of temperature. As an instance of this effect, we might consider the early morning peak load after a large drop in temperature. If the temperature falls during the previous afternoon, then the load will increase as expected; but if the fall of temperature occurs during the night, then the increase in load will not be as great. If the cold weather persisted, then the second morning's peak load will reach its expected value. This time lag can be taken into account by weighting the forecast temperature with a factor given by the previous day's temperature.

To be able to assess lighting demand during the day, it is necessary to know how much light is being provided by the sun, since the deficiency has to be made up by the electricity supply system. Assuming cloudless days, lights will not be required during the height of summer, but in winter some lights will be required throughout the day. In Fig. 1 it can be seen that the daylight intensity at midday in January is 20 kilolux which is about the same as for 6 a.m. in June. Most artificial light is switched on when the intensity falls below 10 kilolux but in intensely built-up areas, e.g. in closely-packed blocks of offices, lights will be required at higher values of daylight intensity. As described above, lighting demand under cloudless conditions will be steady at any one time of the year and will be included in the base load.

Additional demand will be made when the sky becomes overcast. In Fig. 2 two days in April are compared. The dotted line shows a fine day with very little cloud. The continuous line shows how the daylight varies on a showery

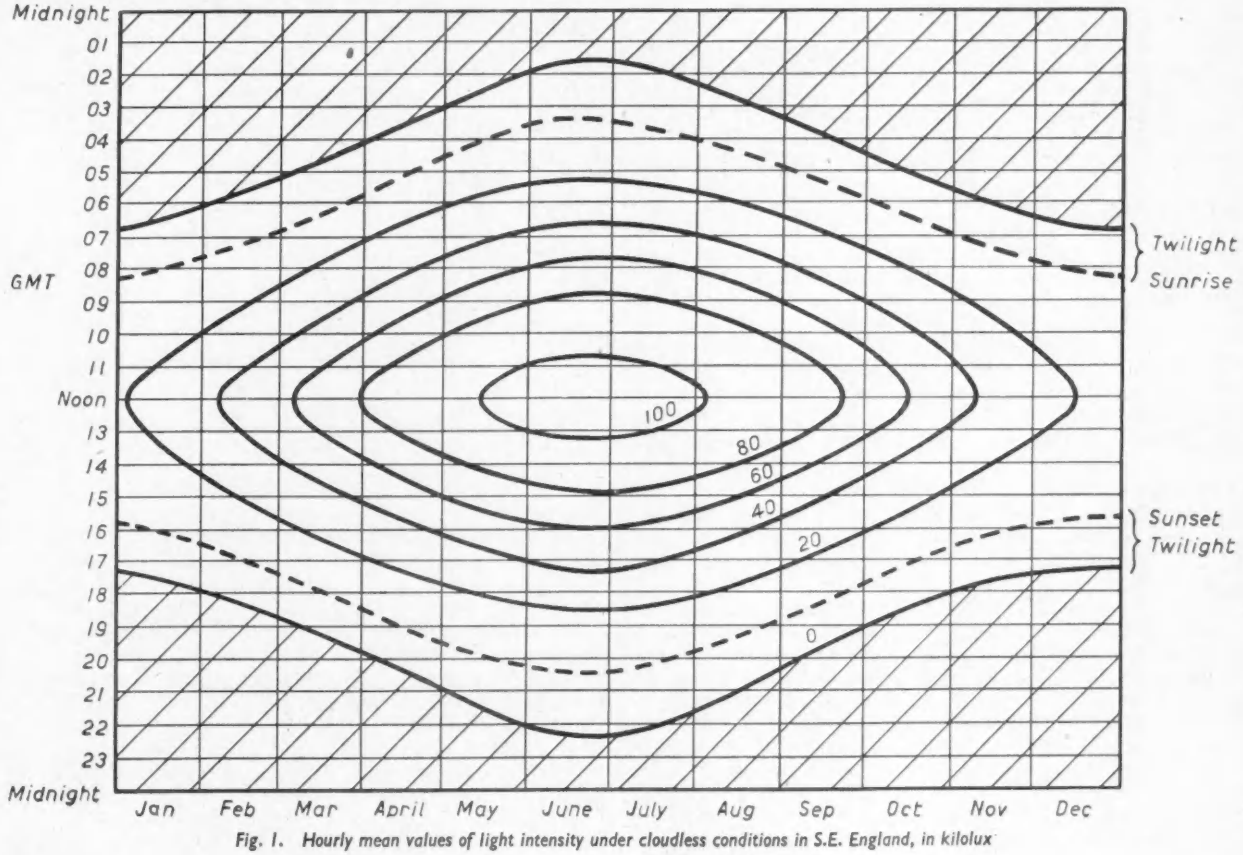


Fig. 1. Hourly mean values of light intensity under cloudless conditions in S.E. England, in kilolux

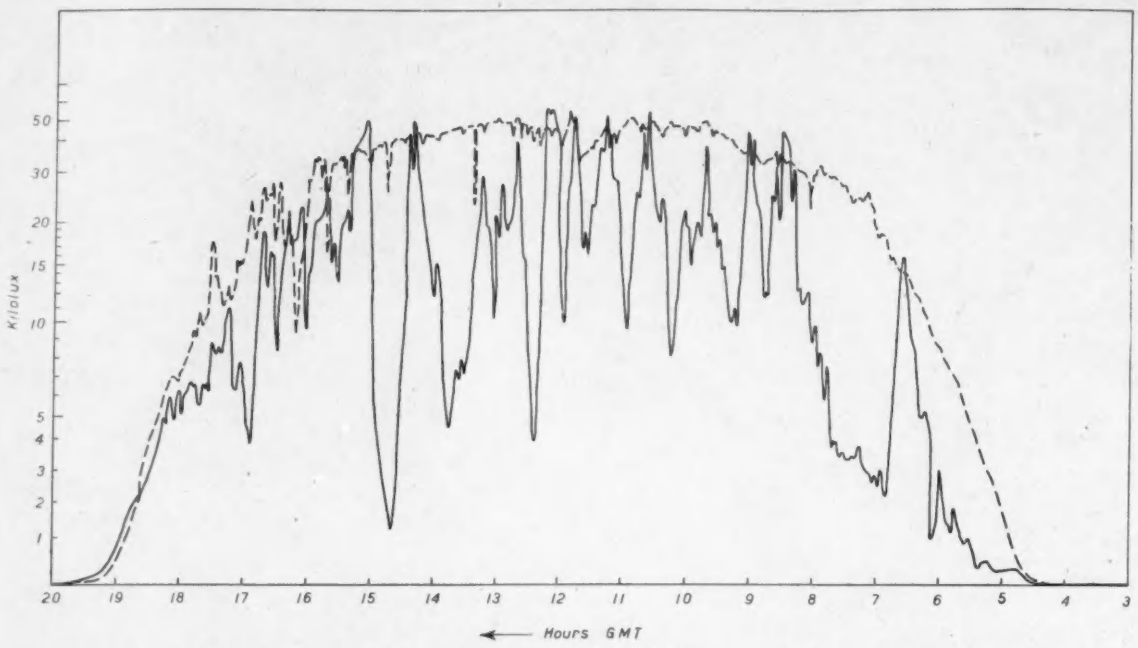


Fig. 2. The effect of change on daylight illumination: a fine day and a showery day compared

day with heavy cumulo-nimbus clouds and sunny intervals. During the passage of a shower cloud, the daylight is very much reduced and it is almost certain that artificial light would be necessary. Further, experience has shown that when lights are switched on in such varying conditions, they are rarely switched off during the bright intervals so that on this occasion there would be a large lighting demand throughout the afternoon. An increase of cloud from clear skies to a thick overcast could increase the peak demand in a built-up area by more than 5%.

The system load cannot be expected to vary directly as the daylight intensity. At high intensities a large change in daylight illumination will have little effect on the load whereas at low intensities the demand increases more and more rapidly as the daylight fails. By correlating demand with daylight intensity falling on a horizontal plane and measured by a selenium photocell, it has been found that the load variation follows closely the logarithm of the light intensity.

Wind strength is closely allied to temperature in its effect. A fall of temperature will be felt more quickly if accompanied by a strong wind.

Other Weather Conditions

It is difficult to assess the effect of fog on electricity demand. Fog will reduce the daylight intensity since it is a cloud formation on the surface; but it is rarely uniform over a wide area. Fog has secondary effects in that temperature tends to remain low in foggy areas. On foggy mornings transport is sometimes delayed giving rise to a temporary reduction in industrial and commercial demand.

Rainfall has a varied effect on demand, depending on where and when it is falling. For example, the Saturday morning load, usually much reduced, will rise to a remarkably high value during a rain shower; this rise is probably due to the large number of shoppers who are compelled to stay at home and thereby becoming users of electricity.

In order that weather information can be used to predict electricity demand a statistical relationship must be obtained between recorded elements of weather and the corresponding loads. With this in mind, a number of meteorological stations have been selected which coincide as closely as possible with the regions of greatest demand. By collecting weather data from these stations for each peak period in the day, a statistical analysis could then be carried out to separate the effects of each weather element on the load, and a regression equation obtained relating demand with temperature, cloud amount and wind speed. The equation is of the form:

$$L = L_N (pT + qC + rW + 1)$$

where L= Peak demand; L_N =Base load; T=Temperature factor; C=Cloud factor; and W=Wind factor; and p, q, r, are the constants of the equation.

Derivation of Factors

The temperature factor will be the difference between the actual temperature at the peak period and the normal temperature to be expected at that time of year.

The cloud factor will be the logarithm of the daylight illumination at the surface measured in kilolux.

The wind factor will be the wind speed in miles per hour or in Beaufort Wind Force.

From the above equation the constants will provide the weather weights, giving the fraction by which a base load must be changed to take account of the variation of a weather element from its "normal" value.

To obtain a base load curve, weather weights, calculated from actual weather reports, are applied to the loads recorded at the same time. By projecting the base load curve and applying weights calculated from weather forecasts, an estimate of future loads can be made.

It can be seen that accurate load estimation will depend upon accurate weather forecasts. Weather forecasters should be well briefed about the applications of their predictions. Weather weights will vary as the nature of electricity demand changes and their reliability will depend on an extensive statistical analysis of past weather data and recorded loads.

Fig. 1 was constructed from Kew Observatory records, made available by permission of the Director, Meteorological Office. The paper is published by permission of the Director, British Electricity Research Laboratories.

Are we shy about Electricity?

By a Contributor

THIS year domestic electricity became respectable once more. The speech of the Minister of Fuel and Power at the E.D.A. luncheon gave an official mark of approval to the sale of electricity for use in the home, and after the long post war years of enforced silence, electricity is at last launching out on an advertising campaign that is designed to sell.

Selling is a competitive business, and the chief competitor, the traditional alternative from whom consumers must be wooed and wrung, is gas. Since it is wise to know your adversary, it is necessary to enquire what weapons and tactics the gas industry is using to resist the electrical attack. And how does electricity go into this new phase of its seventy-year-old fight?

Initiative with Gas

At once it must be said that today, as in the days before the war, it is gas that maintains the initiative and forces the pace. Partly this is due to the tighter structure of the gas industry and to the speed with which the central control in Watson House can act. There was the spur of the forlorn hope, as well. The gas industry found in the exceptional conditions existing after the war an unexpected opportunity to regain some of the ground lost in former years to the upsurgent vitality of electricity. That opportunity was seized, and both advertising and direct selling were infused with a new purpose, as the whole industry strove to make the best of an opportunity which was unlikely to occur again. The urgency of the situation, with the rival temporarily in chains, made those in charge insensitive to the more subtle niceties of the rules governing competition, those same rules which seemed to hypnotise an electrical industry beset by the shame of load shedding into impotent silence. With a careful regard for the letter of these same ordinances, the gas industry made skilful and imaginative use of the opportunities for sales promotion that remained.

That post-war skirmish set the background to the position of the two industries today. Electricity has great plans for expansion. To carry them through, it must learn to fight as a single force with a well understood purpose. The industry must so organise its affairs in this matter of development that it can conduct the expensive operations inseparable from large scale salesmanship today in a manner more single-minded than is evident in the present state of affairs.

Advertising Electricity

Cookers, the central meeting point of the rivalry in the two fuels, provide an example of present electrical shortcomings. When the manufacturer of gas cookers advertises his products to the general public, his story is, this is a gas cooker; therefore it must be good; because it is X's it is better. How different is the approach adopted by the electrical cooker manufacturer. He uses his space to say, my electric cooker is best because. . . . All too often he takes no trouble to sell electrical methods of cooking at the same time; yet this is a task which must be completed before the housewife will be ready to consider his offering. Should he not, then, play a part in this sector of the selling task?

Of late, cooker manufacturers have shown rather more awareness of the need to advertise electricity, but the weight of emphasis remains far too heavily on the particular product. What is needed was shown a year or so ago, when one prominent manufacturer of electric fires took the logical step of concentrating his advertising on creating a favourable background of goodwill for electrical methods of heating at a time when these were popularly supposed to be entirely against the national interest.

The drawback to this exclusive approach of self-advertisement only, is more serious than cursory consideration may suggest. It has to be remembered that in these days when competitive advertising on the part of nationalised industries is hedged around with restrictions, the manufacturer has the greater freedom to say bluntly to the public what the whole industry needs saying. Indeed, if this happens to be uncomplimentary by inference to other forms of fuel, then with the present accent on super-purity in supply industry advertising, there is a likelihood that without the manufacturer's help it will remain unsaid. The public, that is, will remain misinformed.

Cookers have been selected as the example for this tale, but a similar story might be told of other appliances where gas and electricity and, indeed, solid fuel are in competition. Nor is it only the manufacturers who might do better. It is at least questionable whether all the advertising effort of the British Electricity Authority is the most helpful to the area boards and to the retailers in the industry. Will the housewife ever have a working understanding of diversity? Might it not be better to concentrate on the simple message that she will be helping herself and the nation by purchasing certain appliances?

Public Relations

So far only advertising has been considered. It is not possible to consider effective publicity in terms only of formal advertising, however. Unmeasured in its effect, but undeniably potent is the steady stream of opinion and comment which appears in print in papers of all classes and interests, and which finds further outlets in television and radio. For the past seven years, fuel has been news, topical news. Unfortunately, for most of this time, electricity has been the villain of the melodramas that have been related. It is instructive to enquire why.

Partly, electricity has suffered as a result of exceptional and unforeseeable circumstances, or else, as in the case of the generating plant shortage, resulting from a calculated risk taken in the solution of a wartime dilemma. The industry paid little attention to enlightening the man in the street, or those whose opinions he accepted as to the reasons for its apparent shortcomings. In the result a case went by default. Many said electricity was bad—just how was undefined. No one spoke a good word. There was no electrical viewpoint.

There was a gas viewpoint, and one for solid fuel. Those industries had active, forceful spokesman who made sure that their angle on the news was known. Electricity was apparently embarrassed by its difficulties, and so kept quiet. The results have been all too obvious. The episode was a disaster: but at least it has taught a crystal clear lesson. Public relations must back up publicity. We must all be proud of the great industry with which we are associated, and be prepared to say so. The words of that courageous and continual campaigner, Mr R. E. Gamlen, sum up this aspect of the subject: "What a wonderful

thing it would be if we were a completely united industry, undeterred by political influences, fearless in the face of criticism, and ever ready to speak up for our way of life without a backward glance over our shoulder."

For a specific example of the effects of failure in the publicity field, cookers may again be considered. They suffered heavily from the falling away in sales when to use electricity was popularly supposed to be almost unpatriotic. In some cases at least good employees were lost to manufacturers, and production capacity was diverted to other types of apparatus. Now that the demand for cookers is happily back, the aftermath of this unfortunate period is showing itself in many ways, including inevitably long delivery.

Selling in the Field

Out in the field, however, electrical selling compares more favourably with gas. It is really only possible to compare experiences in the nationalised sector of the industry, for there is no gas equivalent of the independent electrical contractor. Showroom practice in the electricity boards is still heavily influenced by pre-vesting conditions, and the existing density of showrooms, and indeed, the planned density, is still one of the more apparent signs of the mutual independence of the area boards. In general, the standard of showrooms in the electrical industry, their equipment and the methods of presentation they adopt compare favourably with what the gas industry has to offer. Whether the standard of salesmanship stands up so well when looked at from a technical viewpoint is perhaps less certain. The electrical supply industry has nothing to match exactly the comprehensive courses provided by the residential schools in which the gas industry trains its leading salesmen. The advantages and otherwise of such a central school are, however, a live subject of debate within the industry, as the last E.D.A. conference showed. On the whole, it is probable that the overall quality of salesmanship and demonstration within the electricity supply industry compares reasonably well with gas.

In selling, as in publicity, gas has the advantage of a looser interpretation of the ethics of competitive selling. The gas industry has not been noticeably keen on the principle of freedom of choice for consumers. When it has been forced to accede to this, however, it takes action to nullify any disadvantages with which it is faced. Gas salesmen carry their canvassing far beyond mere competitive argument. In some parts of the country they will badger the new tenant who has chosen electricity for cooking until he—or more usually, she—is persuaded to change his mind and adopt gas. They are equipped with every aid to facilitate this change of mind; even to a ready stamped post card notifying the electricity board that the signature on a hire-purchase agreement is being rescinded! Such tactics require many salesmen, and ten to electricity's three have been quoted as working on some new estates; but they can bring results.

In all competitive selling, price is, of course, of first importance. Gas salesmen can offer cheaper terms and usually cheaper cookers, facts which sometimes speak more effectively than the greater convenience, better cooking qualities and lower running costs that electrical cooking has to offer. This fact is causing some electricity boards to revise their ideas on hire purchase terms and simple hire. Obviously, however, the best counter to gas in this respect will be cheaper electricity both comparatively and absolutely.

That the gas industry can show nothing like the electrical contractor and retailer has been mentioned already. Relations between electricity boards and contractors have often been strained in the past, but they have shown steady improvement of late. Advantage should be taken of this better atmosphere, the contractors being enrolled in the sales promotion drive of the area boards. It is plainly silly to fight a dangerous adversary with one arm tucked behind one's back. The fight with gas is of importance to all sections of the industry, and everyone should be active in it.

Away with Reticence

Where, then, do these thoughts lead? Only in one direction. The industry needs again the old full-blooded enthusiasm that marked its earlier days. There is yet far to go in promoting the use of electricity, and no good purpose will be served by being polite and namby-pamby merely because other interests have to be incommoded in that advance. But since the supply side of the industry is officially restricted in the work it can do in this sphere, manufacturers and retailers must come more into the forefront of the battle than hitherto. False claims by competitors, backed by plausible half-truths, must be promptly answered and exposed for what they are. The advances of the electrical idea itself must be more vigorously publicised in a way that will reach everyone.

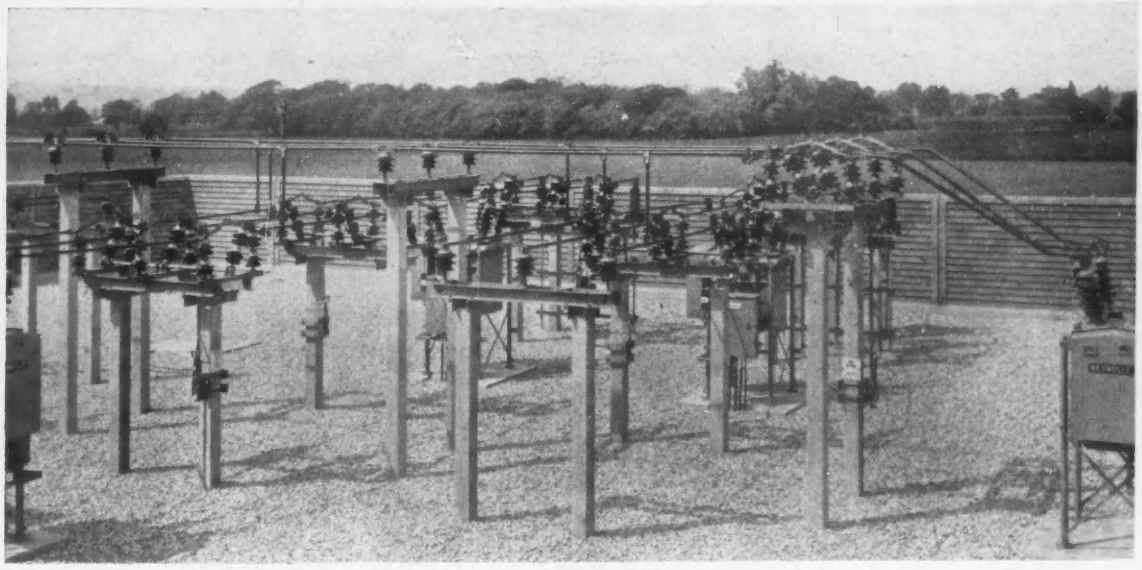
The electricity industry is fully of age. Let it put on its manhood and leave behind the shameful reticence which is keeping it fettered.

N.A.L.G.O. SALARIES WARNING

A WARNING was given by Mr Thomas Nolan, President of the National and Local Government Officers' Association, when he addressed the Association's Annual Conference which opened at The Spa, Scarborough, on Tuesday. This warning was that low salaries were driving away many of the trained men upon whom the efficiency of Britain's local government, gas, electricity and national health services depended. These were among the biggest, most productive and most economically run industries in the country. For 120 years, since local government in its present form came into existence, local government officers had worked for the public good. Not once in all that time had a strike, a stoppage, or an industrial dispute brought their activities to a standstill. One in thirty-three of the total working population worked in local government, spending each year more than £1,000 millions. Local government was the nation's greatest engineering undertaking, building and keeping efficient the sewerage for fifty million people, maintaining 180,000 miles of roads, lighting the streets, supplying pure water and in many cases transport facilities.

Much was heard nowadays of the need for higher productivity, and it was held that this alone justified claims for higher remuneration. Since 1948, gross industrial productivity had increased by 33%, but gas, electricity and water-supply had increased by 65%, nearly double the average. It was, however, impossible to measure the productivity of local government and the national health service in the same way.

Purchasing power had fallen, so that today the pound was worth only 13s. 10½d. in 1946, and although most wages had increased to keep pace with that fall, those of local government officers had not. Nearly half were getting less than £9 per week, and only one in five was getting £12 per week or more. No wonder that employers of local government officers were finding difficulty in getting staff, and losing a high proportion of them after they had gone to the expense of training them.



Substation Design in Seeboard

Economy secured in 33 kV outdoor layout

SINCE vesting day, the South Eastern Electricity Board, like other area boards, has been engaged in continuous expansion and reinforcement of its distribution system. In the course of this work, close attention has been given to the design of the outdoor 33 kV substations which are the focal points of the country sections of the distribution network, and several design principles have been adopted which lead to an economical and effective layout with application to a wide range of conditions. Typical substations are shown in the illustrations that accompany this article, and the story they tell is expanded in the notes that follow.

General Principles

Reinforced concrete supports with steel top hamper are used throughout, except for circuit-breakers, which incorporate their own steel supporting structure: individual concrete plinths are provided for all items of apparatus: cables are laid direct in the ground (Fig. 4) and the site as a whole is covered with a filling of beach or gravel.

Standardised apparatus includes vertical tilting post isolators (Fig. 2), which are preferred to the rotating centre pillar type because of their better performance when dealing with line charging or transformer magnetising currents. Consideration is being given to the use of air-break switches to make and break load currents. Circuit-breakers are of the bulk oil single tank type. They are spring closed, the springs being motor wound and remote electrically released. They are of 500 MVA breaking capacity, and have a current rating of 400 amps: bus section breakers are 800 amps (Fig. 7). In some substations there is no circuit-breaker, but a fault thrower is provided (Fig. 3). This is a rotating centre pillar type switch which connects the line directly to earth, so ensuring sufficient current to bring out the circuit-breaker at the other end.

Transformers for both 33/11 kV and 33/6·6 kV are of 5, 10 and 15 MVA ratings. They are always provided with integral radiators, as this gives a more economical layout in the substation enclosure than the use of separate radiators. Transformers are provided with Buchholz protection designed to operate on surges only. To facilitate test and inspection, the injection pipes from the relay are taken down to ground level. Bare copper tubes are taken directly to the transformer bushings for connection purposes.

The 33 kV overhead lines are run on single wood poles to a BS 1320 type design, using glass insulators and copper conductors. It is the practice to provide sunguards to cables up the terminal poles, taken up to the wipes if possible.

Busbars are of tubular copper, normally of 10 or 8 gauge wall thickness and 1½ in. or 2 in. outside diameter, the diameter being determined by mechanical considerations. No length of copper busbar of any appreciable length is erected without providing a flexible connection to allow for expansion. In this respect, isolators are used as anchor points.

A Typical Substation

Lewes may be taken as a typical large substation to this design. (See above, and Fig. 5.) It is fed from an adjacent B.E.A. 132/33 kV substation, and illustrates the central busbar design which is being widely used. In this design circuits are taken off from either side of the busbars, and there is a tubular copper connector from the busbar isolator of one circuit to that of the facing circuit on the other side of the busbar, these tubes being connected through vertical droppers to the busbars some 3 ft above. The only apparent disadvantage of this economical arrangement is the difficulty of always complying with some such phasing practice as "with your back to the source of supply, the red phase is always on your left." No difficulty is, of course, experienced when circuits are cabled at the substation.

Lewes is provided with circuit-breakers on all circuits, and with a bus section switch. All feeds are taken from

the enclosure by underground cable, and the sealing ends may be seen at the centre of Fig. 5.

Close attention is given to earthing at Lewes and at all substations. Copper tapes and p.b.j. conductors are run throughout the enclosure to provide earthing for all exposed metalwork. Where appropriate, the copper tapes are wrapped with Ozokorite for protection and light insulation. Besides being taken to a local electrode, the earthing system is bonded back to the transformer neutral, thus providing a complete metallic path for the flow of fault current. Use is made of teak battens under cable sealing ends to ensure earthing of short cable lengths at one end only.

Control of the substation is exercised from a small brick building, in which the relays, alarms, etc., are mounted on panels directly affixed to the walls (Fig. 6). Roof lights give a good standard of illumination, and convection heaters are incorporated to prevent condensation. Earth fault and overload protection is provided.

Two of the circuits from the Lewes substation go to feed the town of Lewes itself, via the Malling Down 33/11 kV substation (bottom of this page). The connection is by means of a double circuit line, which in accordance with standard S.E.E.B. practice is run on two separate sets of single poles. Where these are stayed together due to site considerations, insulators are inserted in the common stays to preserve electrical integrity.

At the substation, the lines are terminated on H poles, a tapping dropping straight off to the transformer bushings. Fault throwing switches are arranged to bring out the circuit-breakers at the Lewes substation in the event of trouble. One of the fault throwers is seen in the background of the illustration below; they are interconnected with the 11 kV circuit-breaker which is sited in an existing chamber a short distance away.

Just below the line terminations in the same illustration may be seen the three capacitor bushings of the displaced neutral protection system. This is employed wherever two or more lines enter a substation without automatic switchgear. In the event of an earth fault, the voltage appearing between the centre point of the star-connected capacitors and earth operates a relay to bring out the 11 kV breaker, and hence the interconnected fault throwing switch.

The substation incorporates two 10 MVA transformers, which are equipped for automatic tap changing over a +5 to −15% range. The two transformers are separated by a blast wall in the interests of supply continuity. On the 11 kV side they connect by copper tubes with cables feeding the control chamber already mentioned.

A substation in many ways similar to Lewes is Hartley, which is again a reinforcement substation supplied from an existing 132 kV line. This is illustrated in Fig. 4; it is still under construction. It differs from Lewes in having cable feeds from the Grid Substation rather than overhead lines. The structures for the central busbar can be seen in Fig. 4. In the foreground is a voltage transformer for metering purposes, which is followed by an isolator, a circuit-breaker, busbar isolator, and then the tubular connectors running under the busbar position to a similar sequence on the other side.

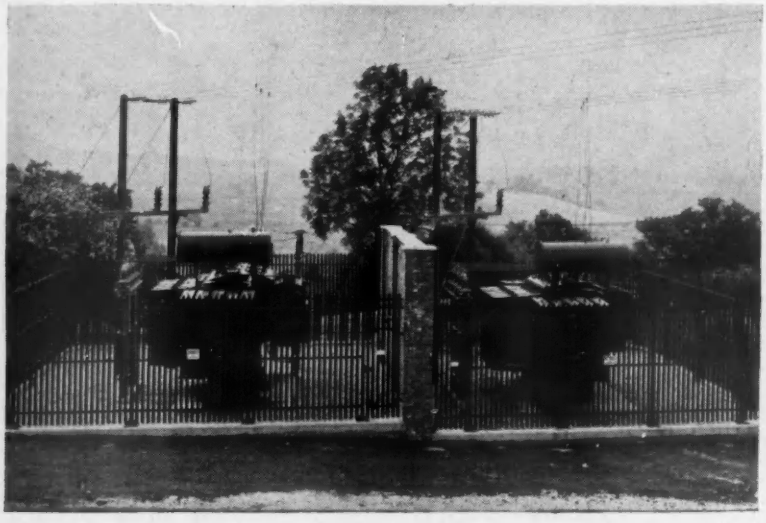
One of the substations which will be fed from Hartley is Gouldhurst, which is at present in a very early stage of construction. Like Malling Down, it is equipped with a fault thrower (seen in Fig. 3). It will be of the central busbar type when completed. Due to wayleave difficulties there will be a small offset between the line from Hartley and the associated busbar isolator, so that the opposite take-off formation may be preserved.

Direct Line Termination

Finally in the illustrations of current practice in the S.E.E.B., the Wrotham 33/11 kV substation falls to be considered. This is operating at present as a single circuit substation, but it is planned for extension to give three future circuits. Its special interest lies in the direct termination of the line on the transformer isolator, as seen in Fig. 1, a close-up view of this termination being shown in Fig. 2. Between the isolator and the main transformer is to be seen the h.t. link voltage transformer. Such a direct connection of line to switchgear eliminates the 33 kV cable terminations which are liable to be a source of weakness when there is trouble with lightning on overhead lines.

It needs to be emphasised, in conclusion, that no claim to originality is made by the engineers of the S.E.E.B. in respect of the details of the substation designs reviewed. Experience is showing, however, that the designs are proving convenient and satisfactory in service as well as economical in first cost.

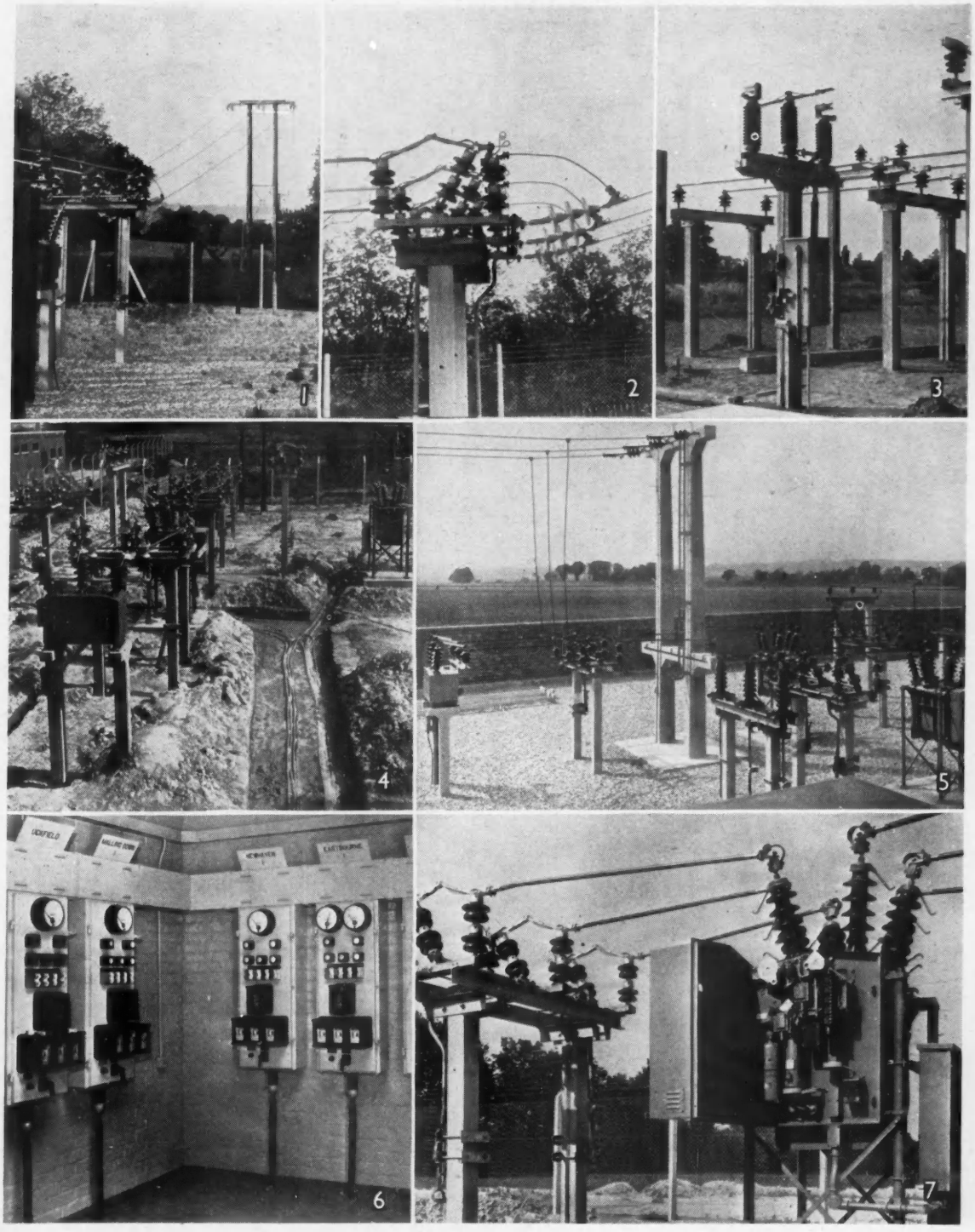
We have to thank Mr W. E. Gibbs, M.I.E.E., M.AMER.I.E.E., Engineer-in-Chief, South Eastern Electricity Board, for permission to publish this article, and Mr L. H. Fuller, B.SC.(ENG.), M.I.E.E., the Board's Construction Engineer, for assistance in its preparation.



The Malling Down 33/11 kV substation is fed from the Lewes substation seen on the preceding page. Prominent below the line terminations are the capacitors for the displaced neutral protection system

Details of Recent South Eastern E B Substations

1 and 2. Direct line termination at the Wrotham substation. 3. Fault-thrower in foreground, central busbars to rear, at Goudhurst (under construction). 4. Cables are laid direct in the ground; a view of Hartley substation (under construction). 5. Lewes substation, showing 33 kV infeed from the adjacent grid substation. 6. Inside the control building at Lewes, showing typical wall panels. 7. Circuit-breaker and isolator at Hartley. Note the earth continuity strip running down the leg of the busbar support structure. All the substations except Wrotham are of the central busbar type and this feature is clearly shown in figs. 3, 4 and 5



READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

The Ring Main Circuit

WITH reference to "Megohm's" notes in your issue of 20th May there are one or two points that I would like to raise with regard to ring main circuits. Dealing with the three 2 kW fixed fires, one assumes that the arrangement was a 7/·029 ring circuit as described in I.E.E. Regulation 201C Exemption (iii) but with each fire being fed through a 15-amp fused point box.

The obvious way to supply these fires is by three separate runs, each of 3/·036 twin cable, supplied from a 3-way distribution board or a 3-way splitter switch fuse, but I would, however, be glad to hear of some discussion on the following possible arrangements: (1) A run of 7/·044 twin cable fed from a 30-amp switch fuse supplying three 15-amp fused spur boxes looped together. In view of there being, in effect, three 1-way fuse boards fed from the same mains, is the 7/·044 cable still a final sub-circuit in the terms of the definition headed "Circuit, Final-sub." in the I.E.E. Regulations? (2) In my area it has been decided that Regulation 201C Exemption (ii) permits of not more than six socket-outlets each of 13-amp rating being looped together, or being fed by spurs from a central point without further fusing, providing that all the cable in the circuit is not less than 0·007 sq in. in cross-sectional area and is protected by a fuse having a current rating not exceeding 30 amps. In this case the three fires in question could each be supplied from a socket-outlet of 13-amp rating mounted adjacent to the appliance in accordance with Regulation 701B, the three sockets being looped together on a 7/·036 cable. If this is done, are the three built-in fires still "fixed appliances" within the meaning of Regulation 201D?

Later in the same paragraph "Megohm" discusses the case of a single socket-outlet fed from the terminals of the 30-amp fuse but does not mention cable size. The same problem has been met locally and I see no objection to this arrangement provided that the terminals of the 30-amp fuse are such that Regulation 313 can be complied with, and also provided that the spur cable is not of smaller cross-sectional area than that forming the ring as provided in Regulation 201C Exemption (iv). I have found, however, that most contractors endeavour to install a ring main of 7/·029 cable with a spur of 3/·036 cable in accordance with the temporary relaxation to Table 5, but this arrangement does not comply with Exemption (iv).

I also feel that the Regulations governing ring circuits do require some elucidation in the light of experience since the twelfth edition of the Regulations was produced.

J. W. Dorrington, A.M.I.E.E.,
BRISTOL.

Cable Trunking

IN his interesting article on cable trunking which appeared in the issue dated 3rd June, "Megohm" mentions the interdependence of the wiring capacities of trunking on the loading of the cables.

His brief mention should be taken as a warning by all consultants and contractors. It should not be left to the wireman to decide what to put in any trunking specified; the decision should be part of the design. Most contractors appear to think that if a run of trunking is specified for some particular purpose in an installation, it can be jammed to capacity with every cable running in the same direction. This practice can only lead to premature failure of cables due to overheating.

Valuable guidance can be obtained if the problem is split up into two parts. It is comparatively simple to decide whether it is physically possible to get the desired number of cables into the trunking, but it is more difficult to decide whether the bunching of the cables has reduced the current ratings below the current required to be carried.

Some guidance is given by examination of the current ratings given in Tables 8 and 9 of the I.E.E. Regulations.

If n is the number of conductors bunched, I_n the current rating when n conductors are bunched and I_2 the rating when two are bunched, then

$$I_n = I_2\left(\frac{2}{n}\right)^{\cdot 32}$$

The above formula agrees with the tables for up to ten conductors bunched and should be a useful guide for more than that number. The issue is complicated where some conductors carry less than I_n, but some allowance above I_n could perhaps be permitted, up to I_2 per conductor, depending on the particular case.

But really we should not have to rely on our own ways of solving these problems. The Wiring Regulations Committee owe us a lead and it would be welcomed.

It is, perhaps, opportune to note that it was announced in November, 1952, that work on a new edition of the Regulations had started, yet all we have had so far is a few minor amendments, including amended tables for conduit capacities. Although the latter could be worked out in about fifteen minutes and presumably the Committee had advance notice of the new cable sizes, there was a lapse of several months between the appearance of the new cables and the publication of the tables.

Ronald Croft,
GOUROCK, SCOTLAND.

Status of the Handyman

PEREGRIN, in your issue of 27th May, gives as one reason for welcoming the electric steam iron the fact that it will cramp the style of the handyman or "the do-it-yourself addict." I have a shrewd suspicion as to the type of person Peregrin has in mind but he is not a handyman and to call him such is to insult the craft to which I deem it an honour and a privilege to belong.

We handymen are certainly addicts to the maxim "do it yourself" and we add the prefix "if you want a job to be well done." Don't flatter yourself, Peregrin, that we will be baffled by an electric steam iron; we are capable of tackling far more complicated things than that.

Come to the "Model Engineer" Exhibition or, indeed, to any Handicraft Exhibition and look around. Can you find professionals today to do the half of what you see? I doubt it. We are the last stronghold of the craftsmen whose demise is so rightly deplored. We take a pride in our work and we get a great sense of achievement from a job well done. Need I add, that a sense of achievement is what is so lacking in the jobs of most people today? But we do need help; we would like to find out how all these things should be done. Give us the information, tell us where we can get the proper materials, and we will do the job, but don't try and stop us—don't make an unnecessary mystery of it because, say what you will, we will continue

to do it ourselves but probably won't do it as well as we might otherwise do.

Incidentally, we look back with pride to the war years when we had queues of applicants for our services on our doorsteps or at our tent doors. Isn't it strange that what is applauded in wartime is so often condemned in times of peace?

I remain, Sir,

a wholly unrepentent Handyman,

E. M. Ackery,
LONDON, W.C.2.

Temperature Controlled Clocks

BY his own words, Mr Sexton, in your issue of 27th May, shows that he has completely missed the whole point of my notes on temperature-controlled clocks. I was not immediately concerned with the statistics of electrical appliance sales, but rather with the fact that a high percentage of such appliances sold are not installed or connected in the proper manner; a regrettable fact which causes unnecessary expense and irritation to everyone concerned.

Further to relieve his anxiety I would assure Mr Sexton that it was indeed an accepted procedure to use thermostat control for space heating socket points, although I will concede, not for switch-sockets, as occurred in this particular instance. It would appear from our friend's remarks that he employs a more efficient arrangement for the same purpose and I would be pleased to hear further details.

If only one out of every one thousand electric clocks sold, as he alleges, is of the self-start pattern, then this indicates a tremendous stock of hand-start clocks, since most reputable clocks of the alarm type are self-starting—presumably on the principle that it is better for the alarm to operate later than not at all, should a temporary supply failure occur during the night hours.

To conclude, I would say that I understand the "Problems and Practice" feature in the ELECTRICAL TIMES is for the purpose of intimating those extraordinary events which by virtue of their unique circumstance produce the perplexities of unusual faults, and I hope that future efforts will be spared the fate of acrimonious dispute.

J. R.,
DUNDEE.

A Retrograde Decision

LONDON Transport are at the moment endeavouring to justify a further rise in fares; for what purpose? Apparently to spend on more imported fuel and in further atmospheric pollution. I am horrified to read of the decision to substitute trolley-buses with diesel-buses. What are trolley vehicles guilty of? Traffic dislocation! Very soon all London traffic will be dislocated if some attempt is not made to improve roads and road use. It is undeniable that trolley buses are cleaner, quieter, carry more traffic and make no exhaust fumes, and use home fuel. The possibilities of nuclear generation makes all in favour of the extension of the electric conveyance. Many transport authorities at home and abroad have already decided in favour of electric traction. To use an expression, are not "vested interests" influencing the Executive?

This retrograde decision must be reversed by the Government. Those of us who had the privilege of hearing Mr G. Nabarro, M.P., at a recent meeting of the Electrical Power Engineers' Association, will trust that he will use his utmost influence to put an end to this nonsense! It is certainly time a national fuel and transport plan, such as he envisaged in his address, is produced.

E. Simons, Chartered Electrical Engineer,
LONDON, W.9.

The Barton Explosion

A PRELIMINARY inquiry has now been held into the circumstances attending the explosion which took place at 2.15 p.m. on 17th August, 1953, at Barton Power Station, Urmston, Manchester. This explosion was responsible for the death of Mr J. A. Dreghorne, a gas welder employed by Messrs Babcock and Wilcox, and four other people were injured. The Report of the inquiry, held under the Boiler Explosions Acts, is available from H.M.S.O. price 6d.

Circumstances of the Explosion

The boiler was of the water-tube marine sectional type, coal-fired with chain grate stokers, and at the time of the accident was evaporating 124 klb/hr of steam at 380 lb per sq in. The explosion was not of a violent nature and general damage was negligible. The cause of the accident was the bursting of one of the tubes, which was torn and the metal folded back leaving an opening about 7½ in. wide and 3 to 8 in. in length, through which the contents of the boiler escaped. Unfortunately, Dreghorne was standing in line with one of the ash trap access doors, through which he received the full force of the escaping steam and water. The other men were injured mainly as a result of scrambling down from the gantry between the boiler concerned and the adjoining boiler which was out of service mainly on account of modifications which were being carried out on the steam pipe range, part of which was located at the back of the boiler concerned in the explosion.

On inspection, it was evident that the affected tube had been severely corroded externally and was very thin locally. It was also noticed that leakage had been taking place from the underside of the superheater centre header drain pipe immediately above the point of fracture.

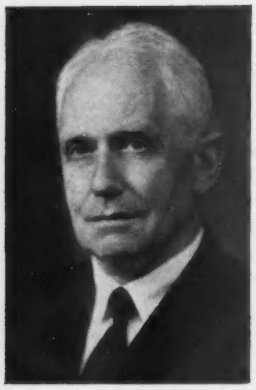
For some 18 months prior to the explosion, conditions of working were such that generally the boilers were under banked fires from about 8 p.m. to 6 a.m. during the week and often shut down completely over the weekends. During these periods it was not customary to open the superheater drains, and consequently the water condenser in the superheater drained through the leak into the soot deposits adhering between a loose brick baffle and the tube. The combination of soot and moisture, together with the constant heating and cooling of the metal surfaces made conditions ideal for the severe and probably rapid corrosion which followed. It was stated in evidence that the practice of keeping the drain closed during these periods was adopted for economy and to prevent as far as possible loss in steam pressure.

There was no evidence as to how long the drain had been leaking, but it was certain that there was no leakage on 24th July, 1953, when a hydraulic test of 400 lb/sq in. was applied, and it appeared possible that the leak was caused by stresses imposed by the constant expansion and contraction of the boiler.

British Electrical Power Convention

BRIGHTER weather gave a good start to the British Electrical Power Convention which is meeting this week at Eastbourne. Throughout Monday, the opening day, the private meetings of the B.E.A. and area boards, and the electrical exhibition were well attended by delegates and their ladies.

The address which Lord Citrine made at the private meeting is summarised on page 911. Those delegates who had a day free were able to inspect the customary electrical exhibition which is housed in a large marquee adjoining the Winter Garden. By general consent, it is the most attractive of the post-war series of exhibitions, and well worth all its boast "the largest electrical exhibition held outside London."



J. R. BEARD, C.B.E., M.Sc., M.Inst.C.E., M.I.E.E., F.A.I.E.E.

Last year's experiment of formally opening the exhibition in the evening was repeated with considerable success. Mr E. G. Batt, Chairman of the Exhibition Committee, introduced the President, Mr J. R. Beard, and made a brief reference to this year's novelty, keeping the exhibition open late in the evening for the convenience of the general public.

On Tuesday morning proceedings commenced with a civic welcome by the Mayor of Eastbourne, Councillor L. W. Pyle. Introducing him, Mr Beard spoke of Eastbourne as the first town to have electric lighting on the sea front connected to the public supply. The Mayor, a farmer, spoke of the great value of electricity in agriculture.

This is the first time that a Consulting Engineer has been president of the Convention, but it is entirely appropriate that it should fall to the lot of Mr J. R. Beard to occupy the chair when the Convention gives especial attention to overseas trade. Mr Beard is at present senior partner in the famous electrical firm of Merz and McLellan, and his work with them has kept him in the closest contact with electric power and traction schemes in many parts of the world.

The President's early training was with that nursery of great electrical engineers, the North Eastern Electric Supply Co., and he was also with the Cleveland and Durham Electric Power Co. before joining his present firm. Besides his professional work overseas, he has been closely connected with the design and construction of the Grid system in this country.

As long ago as 1920, Mr Beard was chairman of the North-Eastern Centre of the I.E.E., and in 1927 he was elected to the Council. It was in his address as President of the Institution that he tackled the question of post-war planning with which his name has been so closely associated. This was a bold step in the uncertain conditions prevailing in the late autumn of 1940, but his vision was an important factor in the setting up of the many study committees which showed the way to some important changes—the ring circuit comes at once to mind. From 1947 to 1949 he acted as Chairman of the Council for Codes of Practice for Buildings, Construction and Engineering Services.

Mr Beard has given his services to many other engineering organisations, amongst which may be briefly noted the A.S.E.E. (Chairman, 1937-39), the Association of Consulting Engineers (Chairman, 1945-46). From 1941 to 1945 he was a member of the Engineering Advisory Committee of the War Cabinet.

Presidential Address

Mr Beard devoted his address to a consideration of the functions of the consulting engineer, with particular reference to overseas trade. Both at home and overseas there have been considerable changes in the type of organisation entrusted with the development of electricity supply, and in the means of providing finance for the increasingly large capital expenditure required. In this setting, the correct use of consulting engineers and the contribution they can make tend to be underestimated, particularly by the Governments, bankers, economists and other authorities responsible for initiating and carrying out electrical power projects in under-developed countries.

As in other professions, two requirements of consulting engineering practice in this country have always been that there shall be no advertising and no soliciting for work. Such restrictions are not, unfortunately, universally applicable, nor is consulting work in other countries always entirely divorced from connections on the contracting side. There is no doubt that today this often affects adversely British overseas trade, particularly in those under-developed countries which have recently acquired self-governing status.

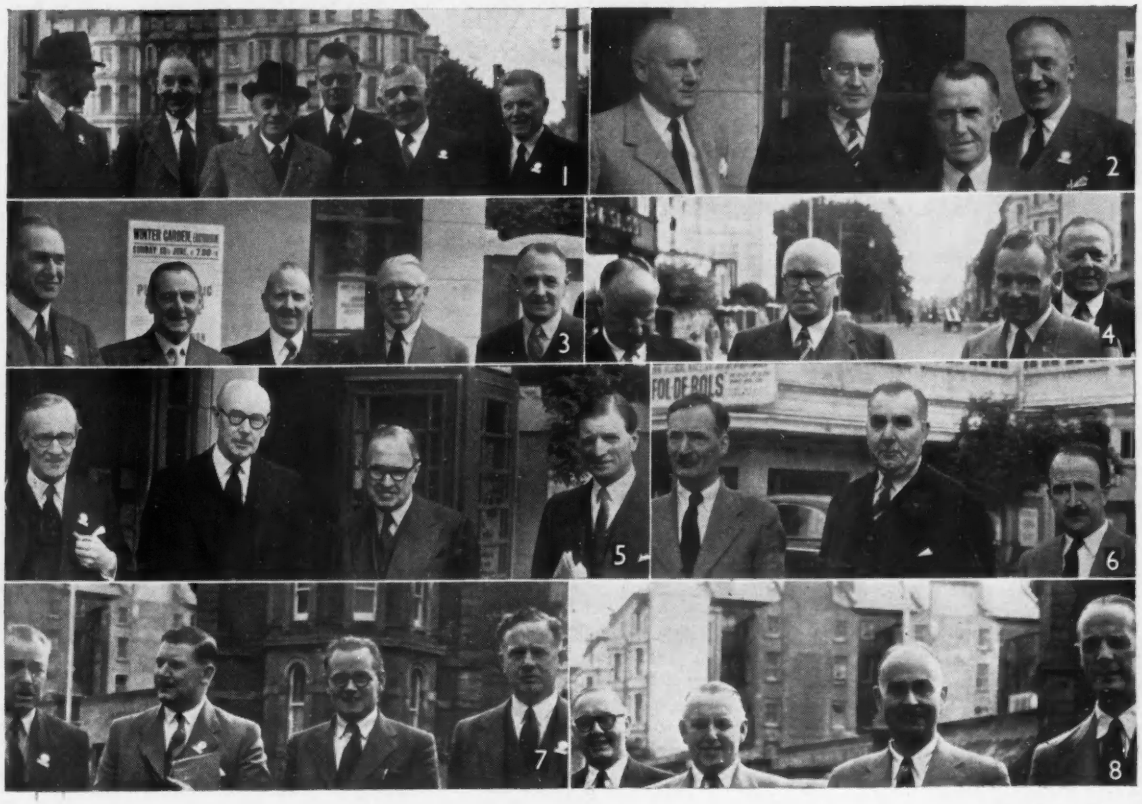
Modern developments have divided consulting engineers into three categories: individuals prepared to advise on unusual technical problems of which they have specialised knowledge; firms of small or medium size particularly concerned with electrical installations for industrial concerns and large buildings; and a comparatively few firms with large staffs, capable of dealing with the largest schemes. It is firms in the third category which can be most helpful to this country in the expansion of its overseas trade and influence.

The fees earned from overseas work are themselves a valuable invisible export, but more important is the widely recognised fact that they constitute the spearhead of the engineering export trade. This by no means implies that British consulting engineers will place their contracts with British contractors. What will be sure is that one common fault of overseas specifications will be avoided. Too often such specifications are drawn in such a way as to make it difficult for British manufacturers to quote. In making such quotations possible, the consulting engineer is benefiting his clients by extending the field of competition. Mr Beard considers, in this respect, that the United States is more ready than is sometimes supposed to associate non-American manufacturers and consulting engineers with American-sponsored projects overseas.

Advertisement

Although the ban on advertising and soliciting will remain for work in Great Britain, there is a growing appreciation of the fact that a strict interpretation of this principle will make it extremely unlikely that British consulting engineers will receive many appointments in some countries overseas. Already some relaxation is permitted in certain Commonwealth countries and the Board of Trade is pressing the matter on the Association of Consulting Engineers. Mr Beard's opinion is that in view of the value of the ethical approach of British Consultants in inspiring confidence in clients, on a long term view any further relaxation should be made with caution.

Delegates outside the Conference Hall. 1, Messrs J. P. Wotton, R. S. Atkinson, Sir Joseph Hallsworth, W. H. C. Pilling, P. Briggs, and J. A. Spence. 2, Messrs Kelso, Haigh, Jones and King. 3, H. I. Hulme, D. McDougall, R. J. Rennie, A. E. Roots, W. H. Hughes. 4, Baillie Airlie and Messrs McLaren, Warren and Hardcastle. 5, A. Haywood, R. B. Sully, A. M. Scott, R. R. B. Brown. 6, J. B. Jackson, J. C. Mitchell, E. C. Scott. 7, C. H. Thorpe, L. Turner, J. Cockburn, M. P. Henzell. 8, Messrs Walker, Corbett, Hayes and Fleming



One of the important factors in overseas electrical developments is the means by which promising projects are encouraged through special arrangements for technical assistance and by loans. In both of these, consulting engineers are directly concerned, and they would seem to be the obvious source of technical assistance and the people who should do most to ensure that loans are properly spent. This does not appear to be as widely appreciated as it should, and Mr Beard goes to some length in a survey of six principal organisations concerned with promoting projects in under-developed countries. A large proportion of the projects they promote are connected with electric power supply, and these too are mentioned by the President.

Individual Experts

Some of the agencies, and particularly the Technical Assistance Board of the United Nations Organisation, seem to make a practice of providing individual experts rather than advice from consulting engineering firms. While this may be the best way of dealing with some projects, it is not the most efficient method for studying large public utility projects. Further, the latest report of the Colombo plan refers to the difficulty of recruiting sufficient high grade individual experts. Consulting engineers really exist to carry out such work: perhaps it is their own fault that their services are not properly appreciated.

In the final section of his address, Mr Beard speaks of the practice that is developing of "turn-key" or "all-in" bids for complete projects. The comprehensive lump-sum price offer covers consulting services, manufacture and construction. In this country it is widely felt that such a system is not usually in the interests of the client. However, the comprehensive offer is undoubtedly attractive to certain overseas clients who do not realise that the normal consulting fee is included, usually at a higher rate, in the comprehensive bid. For this reason, and at the urgent request of the Board of Trade, very careful consideration is at present being given to arrangements whereby British consulting engineers can assist groups of British contractors to put forward comprehensive offers in competition with those obtainable from abroad. It is felt, however, that it should always be possible for the client to appoint the consulting engineer direct after the offer has been accepted, and so revert to the normal practice, which is generally regarded as preferable.

In concluding, Mr Beard refers briefly to the question of atomic energy. The industry has been anxiously awaiting the opportunity to take some part in this development of atomic power, and welcomes the establishment of the Atomic Energy Authority as a separate Corporation responsible to the Lord President of the Council and charged with the duty of developing atomic energy for industrial —as distinct from military—purposes.

Electrical Engineering in World Trade

By Sir GEORGE NELSON, M.I.E.E., M.I.Mech.E., F.C.G.I., F.R.S.A.

KEY paper of the Convention was Sir George Nelson's "Electrical Engineering In World Trade," which ties-in so closely with the Convention theme. Unfortunately, Sir George himself was unable to deliver the paper, which was presented instead by Mr H. G. Nelson. As his starting point Sir George considers the three-fold contribution which the electricity supply and manufacturing industries makes to world trade. The supply industry assists all industries which contribute to our exports; the manufacturing industry has a direct part to play in overseas selling; and thirdly, the manufacturing industry makes an indirect contribution to many other industries which compete in world markets.

It is necessary to ask, with reference to the first of these classifications, whether the installed capacity of electrical generating plant in the country is adequate to meet our special need of producing manufactured goods fully competitive with those made anywhere in the world? Further, is the planned addition to our generating plant sufficient to meet the needs of the future? Sir George feels that there has not been a full realisation by those responsible for deciding financial authorisation of the serious effect of even a small shortage of installed capacity on industry, and thus on the economy of the country as a whole.

It has been pointed out recently by O.E.E.C. that the real *per capita* national production of Great Britain and other European countries is higher than has been supposed, especially by the U.S.A.; the experience of those with an intimate practical knowledge of this country confirms this. Collaboration between workers and management can improve matters further by securing the maximum utilisation of our productive resources, as a result of working double or even treble shifts.

Contribution to Exports

After this broad sweeping survey of the background to electrical exports, Sir George turns to consider the details of his subject. He emphasises that the contribution of electrical engineering to world trade embraces an extraordinarily wide range of articles. For this reason, he is selective in his approach. The usual trio of generation, transmission and distribution, and utilisation receive attention first.

Hydro-electricity is likely to develop on a world basis to about 700,000 MW, while that actually developed is about 90,000 MW. If a 7% per year increase is expected, then the end of hydro development is in sight. However, it must be remembered that water power will not be affected by nuclear energy development, so it will figure in exports for many years to come. Steam generation so far as export trading is concerned, can be considerably assisted by international standardisation. However, the fact that the North American continent has standardised on 60 c/s means that two separate sets of preferred standards are required, as turbine designs for 50 and 60 c/s are radically different: as a result, the North American market has to be regarded as effectively a separate entity from the technical and design point of view.

The demand for overhead outdoor transmission lines overseas is likely to continue for many years, and in this respect the development of the 275 kV Supergrid has been very welcome. Increasing costs of terminal equipment may set a limit to the maximum transmission voltage

A smiling Lord Citrine arrives at Convention. Also outside the Hall are seen 1, Messrs T. H. Atkinson, C. B. Cleland and G. R. Wibrow. 2, An earnest discussion ensues between V. W. Dale, A. N. Irens, E. L. Gethin and R. Baldwin. 3, T. Coxon chats with D. G. Browne. 4, W. S. Lewis and Ald. A. E. Bennett share a joke. 5, Sir Henry Self outside the Hall. 6, Messrs C. T. Melling and S. F. Steward arrive together. 7, Messrs Mollan and G. A. Vowles. 8, R. V. Read, S. W. Owen, S. H. Parker and C. E. Walters

which can be adopted, and in, say, ten years' time there may be difficulties in transmitting the power required to some large load centres, because of the number of transmission lines required.

Sir George continued with a discussion of the use of electricity in certain selected industries, and in the home, and he concludes this section of his paper with a reminder that the increasing complexity of modern engineering projects is leading to departures from the old practice of ordering each component or class of equipment from different manufacturers. Particularly in new and developing countries, where technical and administrative staffs are inadequate for expanding needs, there is an ever-growing preference for ordering a complete project from a leading contractor. Organisations in the United States and elsewhere exist for carrying out such comprehensive contracts, and if British products are to be sold to countries who favour such procedures, it is essential that similar facilities should be available in this country.

Future Developments

In the final section of his paper, Sir George discusses the impact of raw materials, electronics, and atomic energy on electrical engineering. On the subject of electronics, it is suggested that there are no problems in the actual design of an automatic factory which cannot be solved by electronic control of the equipment. It does, however, need a qualified maintenance staff to locate and correct the minor faults, and valve circuits should be designed with monitoring circuits, to facilitate maintenance. It is fair to say, however, that once a fault is tracked down, it is easier and cheaper to repair in an electronic installation than in more mechanical units.

So far as materials of construction are concerned, great hopes are held out for titanium, the eighth most common element in the earth's crust. If the problems of producing it economically can be solved, then its advantages of lightness and great strength, and the corrosion resistance qualities of its alloys can do much to advance the design of rotating machinery.

Generally, in the field of metals, no very outstanding achievements seem possible without increasing knowledge of the fundamental problems. While in magnetic materials, for example, the tendency has been to eliminate impurities and to develop on a large scale metals of a purity previously unknown, this has resulted mostly in reducing the electrical loss of the material, but so far there has been no substantial increase in the limit of saturation.

Every encouragement should be given to facilitate the fundamental research work which will ultimately enable materials to be constructed with very much more desirable properties. This outlook is found both in the use of metals in conventional electrical engineering and also in the atomic energy field.

The study of the physics of the solid state would certainly provide basic information for the further development of electrical equipment and help to maintain our competitive position in the world markets.

Atomic Energy

In conclusion, Sir George touched briefly on atomic energy, stating that in its use for power generation, a start of some ten years over most other countries and sufficient productive capacity to tackle the job are appreciable advantages for British industry. The engineer and the industry must learn to use and handle new materials—to add liquid sodium and heavy water and a host of others to the range of ordinary engineering materials, neutron economy must become as familiar to the electrical engineer as power factor. The process of creating a new engineering within electrical engineering will be difficult and will not be complete in the lifetime of those who started it, but it is within our capabilities.

Lighting for Commerce, Industry and Home

By W. J. JONES, M.Sc., M.I.E.E.

THIS year there is being celebrated the seventy-fifth anniversary of the invention of the electric incandescent lamp, first by Sir Joseph Swan in this country, and a little later by Mr Thomas Edison in the U.S.A. Thus it is appropriate that there should be a lighting paper at the Convention —and who better to present it than Mr W. J. Jones, Director of E.L.M.A. He recalls that allowing for the fall in purchasing power, the real cost of lighting compared with twenty years ago is no more than one-quarter for tungsten and one-fourteenth for fluorescent lamps. Because of this fall in cost, more and more light is being used, with the trend towards 20 to 50 lumens/sq ft in place of the 5 to 10 lumens/sq ft of two decades ago. Efficiencies of lighting have increased steeply over the same period, but, on the basis of recent statements, it seems that a 50% increase in that of the fluorescent daylight lamps may, for example, be expected.

Colour

Colour provides an ever-present complication when fluorescent lighting is considered. It appears that a stage has been reached when a decision needs to be made whether to have better colour rendering and make things look as they are expected to look, at the expense of efficiency or whether future development will be solely on the basis of higher efficiencies at the expense of colour. It is worth noting that there is today world-wide interest in the specification of a "white" colour of fluorescent lamps, and on the basis of I.E.C. discussions, there appears to be a possibility of standardising on three whites, one blending well with daylight, another with incandescent light, and another blending fairly well with both.

Over the years 1946/51 there was, on average, an increase of 60% in the amount of energy used for shop lighting. The adoption of higher levels of illumination, which makes shop lighting more effective and appreciated, is resulting in an improvement in utilisation factor and in load factor. It can be argued, incidentally, that the higher the installed lighting load, the greater the return to the supply authority on capital invested.

If lighting in shops has noticeably improved, it is the need for improvement that is more apparent in offices. Official reports continue to draw attention to the fact that prevailing illumination levels are too low.

So far as industrial lighting is concerned, recent years have seen a growing realisation of the advantages of high illumination levels. Coupled with this has been the realisation that lighting involves far more than locating light sources symmetrically to produce a general level of illumination. The engineer must consider the task and the surrounds and plan the brightness levels in such a way that seeing is done with the minimum of effort. Modern lighting is well within the ability of industry to afford, especially when the benefits in production, safety and welfare of operatives is considered.

Domestic Lighting

In discussing domestic lighting Mr Jones returns to his advocacy of provision being made for the housewife to buy lighting fittings that can be taken home and plugged in, as simply as that. Socket-outlets would be required on walls and ceilings to make this possible. The future of the electrical industry in the domestic field depends largely on appealing to the 11 to 12m households in the medium and lower income groups. It must be borne in mind that 1¼m dwellings are not yet wired for electricity.

Ilumination levels in the home are far below those recommended. The last available survey figures, however, relate to 1944, and there is a need for a fresh survey on similar lines. The 1944 survey showed that 89% of dwellings had "very bad" lighting in the scullery or kitchen, and 80% similarly "very bad" lighting in the kitchen or living room. The latter value was set at 4 lumens/sq ft on the table. This compares with a recommendation of 10 to 15 lumens/sq ft made in the appropriate British Standard Code of Practice.

At the base of the domestic lighting problem is the need for more socket-outlets and for wall-bracket fittings for secondary lighting. It is of interest to compare the official British Code of Practice with similar American recommendations. The British level is three socket-outlets per living room and two per bedroom; for the U.S.A. the living room basis is "no point on wall more than 6 ft from an outlet; any wall space of 3 ft or more to have an outlet." For the bedroom, the recommendation is similar. Unfortunately, the average number of socket-outlets installed in new houses at present appears to be only about two per house. A recent survey has shown that in the U.S.A. there is an average of 2 to 3 portable lamps per room, apart from other appliances using socket-outlets.

Public Lighting

Great Britain is not making the best use of its discoveries in street lighting. Out of some 1·5m street lamps, no less than 600,000 are still lighted by gas. At the present rate of change-over, 20 years will elapse before all these are changed to electricity. It has been argued that because of this, money should be spent on modernising existing gas installations. On the contrary, there is every reason why the Ministry of Transport should press the Treasury to sanction the spending of £18m on the conversion of all gas installation where practicable to electricity within, say, a period of five years. Even in 1939 it was estimated that, for the same light output, electricity at 1d. per unit corresponded to gas at 3½d. per therm, and since that date efficiencies of electric lamps had greatly increased. The development of mercury, sodium or fluorescent lighting sources favoured electricity even more.

In conclusion, Mr Jones points out that in the translation of the energy of coal into light, two-thirds was dissipated as waste heat in the power station, and of the one-third left we can at present only transform one-sixth as white light. This represents an efficiency of only 5½%. Sometimes comparisons were made with the glow-worm, but it had been estimated that to produce 1,200 lumens, would need 15,000 glow-worms, and in order to maintain the light-emitting capacity each glow-worm would have to eat one snail per day. How much easier to use a 100 W lamp.

Electricity in the Modern Home

Dame CAROLINE HASLETT, D.B.E., J.P., Comp.I.E.E.

ELECTRICITY in the home, considered in its relation to the life of the nation and to the lives of individuals, provides a subject which Dame Caroline Haslett, in the paper presented for her on Wednesday, is able to discuss with authority in all aspects. She defines the aim of her paper as an assessment of the position in Britain with reference to the use of electricity and electrical equipment in the home, and an examination of the way in which an electrical Britain contributes to an electrical world.

For the last quarter of 1953, there was a strong revival in the production of all electrical domestic equipment, in contrast to the low levels reached during 1952. A partial reason may be found in the removal of restrictions on the use of raw materials, the release of more apparatus for the domestic market, and reductions in purchase tax. Factors working in the opposite direction include remaining high p.t. rates and h.p. restrictions, which affect refrigerators, and increasingly strong foreign competition in respect of irons and kettles.

That Britain is in the forefront of domestic electrical progress is recognised by her customers overseas. Her only real competitor at the moment is the U.S.A., though a rapid advance by Germany took her exports to half that of this country, and Japan is looking for new markets. An important limitation on domestic electrification at home is inadequate wiring, and an insufficiency of socket-outlets in many homes.

After a survey of the more important electrical appliances, and of their application today, Dame Caroline goes on to discuss the user's viewpoint. She emphasises that housewives, having heard repeatedly that their use of electricity stopped the industrial machines, have now to learn that the increased use of electrical equipment in the home not only cheapens electricity for industry but also aids the production of domestic electrical goods for export.

People today want apparatus which is truly safe and reliable, and which fits in with their particular way of living. While the British public is becoming more articulate on its requirements, it is felt that the electrical manufacturing industry is indeed showing initiative and imagination in keeping abreast of, and even anticipating, social change.

What is true of the needs of homes in Britain is also true of homes overseas which await electrification. Different customs like regional habits in this country, must, however, be taken into account when designing equipment

Delegates and Visitors in the Exhibition Hall. 1, In this Simplex group are E. G. Plucknett, Joan Whitgift and E. Wilson. 2, Mr and Mrs H. T. Scott with Mr and Mrs R. A. McMahon. 3, J. J. Looker and A. Montgomery. 4, Mr and Mrs W. K. Allen with Mr and Mrs B. A. G. MacFadden. 5, Mrs Ansell, A. G. Wood, R. E. Ansell and F. R. Cook discuss a problem. 6, Mr and Mrs A. W. Ferguson chat with J. O. Johnson. 7, R. Berry, J. A. Fraser and R. M. Hawkins. 8, Messrs M. R. Wagner and C. W. Parry inspect an exhibit. 9, J. A. Tatem, E. W. B. Davis and T. Allen. 10, G. Caton, T. G. Christie, G. Hodgkin, F. V. Vaissiere and R. Cox. 11, T. S. Crabtree (right) converses with B. C. Skinner

1, Lord Citrine addresses delegates at the B.E.A. private meeting. 2, The President opening the Convention Exhibition. 3, L. J. Luffingham, F. A. Rawlings, Mr and Mrs W. J. Rowlands seen after the opening ceremony. 4, W. J. Collins, J. S. Nichols, Mrs W. J. Collins, Mr and Mrs G. B. Proctor. 5, E. G. Batt makes a presentation to Mrs Beard, wife of the President. 6, Messrs J. D. Markland and W. L. White. 7, Mr and Mrs J. I. Bernard with Mrs L. P. Hassauer. 8, A Henley's group. J. Dunford-Smith in conversation with Dr and Mrs Dunsheath

for export. In "under-developed" countries, the public appreciation of electricity will have to be awakened, but it is expected that once started, advance will be rapid, as with other twentieth century technical progress. If the problem is tackled aright, there should result a sustained and developing demand for a complete electrical service in the home, and not just the sale of isolated items of domestic equipments.

A Social Unit

It is pertinent to ask why the public want electricity. On the basis of an analysis of electricity bills in their social context, certain broad deductions can be drawn. For instance, the link-up between a considerable amount of home cooking and the use of radio and television indicates that electricity is re-emphasising the importance of the home as a complete social unit, in contrast to the trend which began some time ago of seeking entertainment outside the home. It also seems that motor-operated appliances seldom appear singly; once the convenience of one is experienced, further appliances using electric motors are quickly purchased.

Yet, although electricity is doing so much, it is necessary to keep clearly in mind the fact that its very effects on family life are creating new requirements. For instance, heating and lighting installations in the home need to be redesigned to take account of new habits. At the other extreme of consideration, the future effects of having electrical economy no longer tied to coal have to be considered. The development of nuclear energy should mean that the widest possible use of electricity should be the goal of optimism towards which we plan.

In this connection the research now being carried out on domestic requirements is important. At the moment, for example, the E.R.A. is carrying out work into the application of the heat pump to space and water heating. There are, however, many problems yet to be solved. In America, where climatic conditions are different, the cheapest unit costs about £450 for whole house heating. In this country it may be possible to obtain more economic results by using the heat pump in a more limited function. The dual-purpose heat pump, which can also act as a refrigerator, will be of interest to all branches of the industry as it can provide the area boards with a high load factor and at the same time satisfy the user by giving the facilities which have hitherto only been available by the purchase of two separate appliances.

In the conclusion to her paper Dame Caroline suggests that manufacturers can be optimistic and housewives have every confidence regarding the future of domestic electrical appliances. Overseas buyers may know that the proved reliability of British goods is allied to the adaptability of British manufacturers in taking note of the special needs of overseas homes.

A valuable appendix to the paper sketches the electrical pattern of a number of typical homes in defined areas of Great Britain. The annual electricity bills concerned ranged from about £9 up to £104. A six-roomed semi-detached all-electric house somewhat surprisingly accounts for the lowest value, the occupants being a young married business couple both out at work in a north-west industrial city. £104 is recorded for a principally electrically-fueled house occupied effectively by three families in a higher income group.

Lord Citrine Comments

ADDRESSING the Conference of B.E.A. Delegates to the B.E.P.C. at the Winter Garden, Eastbourne, on Monday, Lord Citrine reviewed the progress made since vesting day. Over half a million consumers were added, bringing the total up to nearly 14½ million. The shortage of steel, two years ago, had adversely affected the commissioning of new generating plant which amounted to 1,413 MW (s.o.) as compared with 1,539 MW (s.o.) in 1952. It was anticipated that the upward trend would be resumed in 1955, and would rise to 1,950 MW in 1959. In this latter year's programme, there were included sets of 200 MW with unit boilers of 1,400 klb/hr steaming under conditions of 2,350 lb/sq in., 1,050° F with reheat to 1,000 °F. The power station containing these sets would be at High Marnham on the Trent, ten miles from Newark.

To maintain the availability of generating plant on an improving basis, and to expedite repairs, the Authority had decided to establish a limited number of their own central workshops, and plans for the first two of these were being worked out.

The Power Situation

On the power situation, Lord Citrine commented that during last winter there was only one power-cut, and twenty-one instances of load control by voltage and frequency reduction, compared with six power cuts and eighty-six instances of load control in the winter of 1952/53. On 2nd February, 1954, the plant carried a record load of 15,430 MW.

Because of fuel shortage, dual firing (oil or coal) was under consideration for Marchwood, and the Authority was examining the position in respect of sixteen other stations. At the same time the B.E.A. had established close co-operation with the Atomic Energy Authority and members of the engineering and technical staff were being trained in the design, construction and operation of nuclear power reactors.

District heating and similar projects were under consideration at Bloom Street (Manchester), Spondon, Stepney and Warrington, while the economics of the Pimlico scheme were under close investigation.

Finance

Further progress had been made in the simplification and standardisation of tariffs and attention paid to special terms for off-peak loads, with a view to improving the load factor.

Some 185,000 employees were now engaged in the industry, an increase of 1·9% over the previous year. Increases in salaries during the year, however, were estimated to cost a total of nearly £3½ millions. In order to obtain information and experience of the working of a unit larger than the existing divisions it had been decided to amalgamate, as an experiment, the M. and N.W. Division and the N.W. Division and a Bill had been introduced into the House of Commons with the view of establishing a new South of Scotland electricity board, with similar rights and responsibilities to those of the N. of Scotland H.E. Board. The Government felt that in those circumstances the title "British Electricity Authority" would no longer be appropriate and should be changed to "Central Electricity Authority."

WOODHEAD TUNNEL OPENED

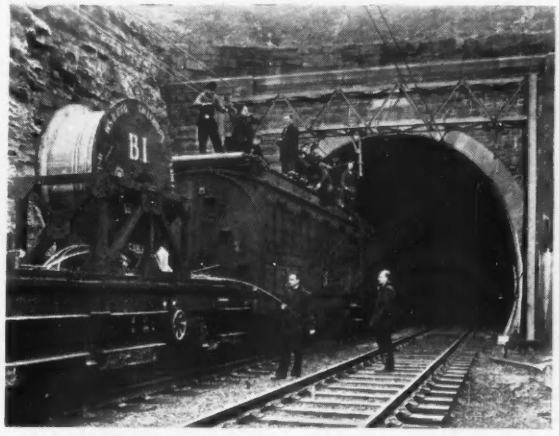
WHEN the Rt. Hon. Lennox-Boyd, M.P., Minister of Transport and Civil Aviation opened the New Woodhead Tunnel, he marked the completion of one of the most difficult railway engineering tasks undertaken in recent years in this country. The original Woodhead Tunnels, on the Manchester/Sheffield Line, were completed in two stages, the first one having been opened in 1845, and the second in 1852. Each of these tunnels carried only one track, and each was just over three miles long. However, as the tunnels neared their century of existence, it became evident that the deterioration was becoming too rapid for maintenance to keep up with it. Accordingly it was decided to proceed with the driving of a new two-track tunnel and on 15th November, 1945, authority was given by the Railway Executive for the work to proceed. This decision was accelerated by the project of electrification of the Manchester/Sheffield Line.

Just over six single-track miles of B.I.C.C. overhead electrification equipment was installed in the tunnel. Four tension lengths are installed over each track, each length being about ¼ mile long from anchor to anchor, while the average span length between supports is 146 ft. The catenary wires are supported on diabolo insulators which are fixed to beams in the roof of the tunnel.

The steelwork is bolted to ceiling brackets fixed by means of Rawlbolts into recesses high up on either side of the tunnel wall. Immediately following the erection of the steelwork, all beams through the tunnel were connected by an earth wire. The time taken for the complete erection of all supporting steelwork, overhead lines and fittings was 35 working days.

Through the tunnel on brackets attached to the wall on the up side is laid a 33 kV, 3-core 0·10 sq in. H.S.L. cable to provide power to the traction substations and this serves as a connecting link between supply points in Lancashire and Yorkshire. The substation supervisory control cable follows a similar route.

Two new signal boxes control the working of traffic by colour light signals, and this is arranged for either-way working on both tracks, for which purpose special single line electric token instruments have been installed.



View at the entrance of the tunnel to show the catenary under construction

Faults on a Distribution System

EASTERN BOARD ANALYSIS HIGHLIGHTS ADVANTAGES OF ARC SUPPRESSION EARTHING

By T. SMITH, A.M.I.E.E.*

IN July 1950 the Eastern Electricity Board introduced a fault reporting scheme and a system of classification of faults for use throughout its area. This scheme set out a uniform method of reporting and classifying faults in place of the previous existing arrangements, which had been found unsatisfactory owing to different practices in different parts of the area. A standard fault report form, Fig. 1, was introduced to supersede the several kinds of form then in use.

Board Statistics

The Board's area covers some 8,000 square miles of territory and its high voltage distribution system includes nearly 6,000 miles of overhead lines, nearly 5,000 miles of cable and over 14,000 transformers. It was felt that on a system of this size an analysis of faults could be carried out on a statistical basis and a great deal of useful information thereby obtained. The results would, it was thought, be largely free from distortion caused by local peculiarities and thereby enable more reliable conclusions to be drawn.

The objectives of the analysis were first determined, and were considered to be:

(i) to enable the best and most trouble-free types of apparatus to be selected for new works;
(ii) to enable improvements to be made to existing apparatus;
(iii) to enable improvements to be made in operating technique;
(iv) to enable improvements to be made in protective gear operation.

The qualifications of an incident for inclusion in the analysis had to be closely defined, as it had been found that certain incidents were reported as faults from some parts of the area and not from others.

The objectives cannot be attained by including only those faults which cause interruptions of supply to consumers, as this depends on whether a duplicate supply is available and whether the protective gear operates correctly. A similar kind of fault on a single circuit would, of course, cause an interruption.

TABLE I. MILEAGE OF OVERHEAD LINES AND CABLES.

System voltage	O.H. lines end 52/53 circuit miles	Cables end 52/53 circuit miles
2 to 5 kV	94	935
6·6 kV	313	709
11 kV a.s.c.* ...	2988	874
11 kV s.r.* ...	1442	1617
22 kV	151	112
33 kV a.s.c.* ...	235	28
33 kV s.r.* ...	618	588

*a.s.c.—arc suppression coil earthed; s.r.—solid and resistance earthed

A simple definition was not found possible and finally the incidents to be reported and included in the analysis were defined as:

(*a*) Any incident resuling in loss of supplies to consumers.
(*b*) Any incident resulting in the outage of plant or equipment, other than as a result of normal system operation.
(*c*) Any incident resulting in system irregularity due to mal-operation.
(*d*) Any incident, of an electrical nature, resulting in fire, explosion or damage to property or equipment.
(*e*) Any incident, of an electrical nature, involving injury to the Board's personnel or others.
(*f*) Defects revealed during routine inspection or maintenance which indicate shortcomings in design or manufacture.

Reports under item (*f*), of which there are very few, are not intended to be a record of routine inspection or maintenance. They are only required to draw attention to those features of apparatus which experience has proved to be inadequate for their purpose, and which require modification to make them satisfactory, but which have been discovered be causing an incident as defined in (*a*) to (*e*) inclusive.

The analysis is confined to systems operating at voltages of 2 kV and above. Faults on the l.v. system are not included unless they cause outages of high voltage apparatus, such as occurs when there is incorrect discrimination between the h.v and l.v. protection of a transformer.

Fig. 1. The front of the standard fault report form. On the back are spaces for noting operation of protective gear, particulars of damage to equipment, and pole top and system diagrams. There is also provision for remarks and recommendations

EASTERN ELECTRICITY BOARD

FAULT REPORT FORM

Classification

Serial No.

From ..... SUB-AREA
..... DISTRICT

Copies to:- .....

1 DAY | DATE | TIME

WEATHER | EXCEPTIONAL LOCAL CONDITIONS

2 PLACE OF OCCURRENCE

3 SYSTEM VOLTAGE | PHASES AFFECTED

FAULT M.V.A. (approx.) | METHOD OF EARTHING SYSTEM NEUTRAL

RUNNING CONDITIONS

4 CAUSE OF FAULT

5 DESCRIPTION OF OCCURRENCE

6 SUPPLIES INTERRUPTED

Lines and/or Substations affected	Time Off	Time On	Duration	Consumers Off	Load Lost kW	Transformers Off No.	Transformers Off kVA

* Mr Smith is with the Eastern Electricity Board

The classification is divided into six main groups as follows: 1, Overhead lines; 2, Cables; 3, Transformers; 4, Switchgear; 5, Protective gear; 6, Miscellaneous.

Each main group is sub-divided into a number of fault causes. In an investigation on this scale the classifications must be broad in their scope and the main groups must not be sub-divided too finely. It is neither possible nor desirable to include a separate classification for all the possible kinds of fault that can occur, and considerable grouping and selection is necessary, having regard to the influence of the faults concerned on the design of systems and apparatus.

In addition to being classified under causes of faults each incident is also classified under a number of other headings. In the case of 11 kV and 33 kV systems the classification is extended to bring out any difference between systems with the neutral earthed by means of an arc suppression coil and systems with the neutral earthed by solid or resistance earthing. Faults are also classified according to whether they were cleared by circuit-breakers or by fuses; whether the protective gear operated correctly or incorrectly; and, where relevant, according to type of apparatus.

Preparation of Analysis

The classification of the fault reports drawn from the whole of the area under the headings required presented a problem. Various types of accounting machines to do the job mechanically were considered, but it was felt that the cost of such machines was not justified. Eventually a simple punched card system was adopted and has proved satisfactory. The cards used are shown in Fig. 2.

In order to provide a uniform standard of comparison the fault incidence is expressed, where appropriate, in terms of faults per 100 miles of overhead line or underground cable per annum, or per 100 transformers per annum, as the case may be. Switchgear and protective gear faults, being relatively so few, are not amenable to expression in this way, nor are faults grouped under "Miscellaneous," and in these cases the numbers of incidents only is given.

There are, of course, many faults which are of special interest for technical or other reasons and a brief description of these individual incidents is given in the annual analysis.

The first few months after the scheme was introduced were regarded as a trial period to get the scheme under way. Analyses have, however, now been completed for the two years 1951/52 and 1952/53 and a great deal of useful information made available. Some details of the analyses for these years are given below. It has been found that the fault incidence in parts of the area is higher than the area average owing to the standard of construction of the distribution system in those parts, as taken over from certain pre-vesting undertakings, being below the general level of the rest of the area.

In considering the results, it should always be borne in mind that there are likely to be variations from year to year and that some years must elapse before a stable cumulative average will be reached. This yearly variation is likely to be greater when only a small mileage of line or cable or a small quantity of apparatus, is concerned, and a longer period will then be required before reliable conclusions can be drawn.

The total number of faults occurring during the E.E.B. financial years 1951/52 and 1952/53 in each main classification group is shown in Fig. 3. As might be expected, overhead line faults form the majority. It is now proposed to discuss the results obtained under the separate headings.

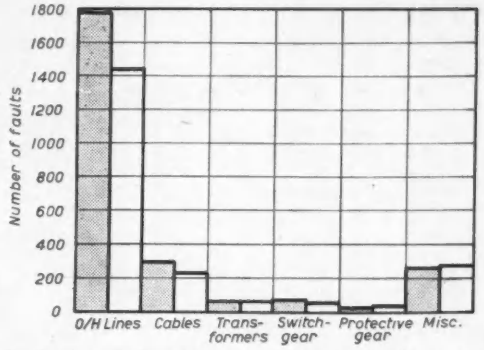


Fig. 3. Total number of faults in each main classification group. Tinting here and in other diagrams indicates 1952/53 results

Overhead Lines

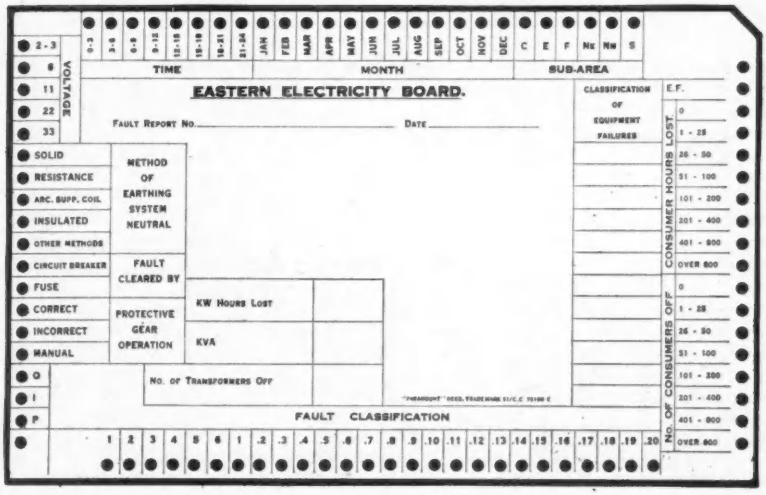
A start may be made with the various faults occurring with overhead lines. At the end of the period covered the approximate mileage of the Board's high voltage overhead lines were as given in Table I.

The fault incidence on overhead lines of different voltage is shown in Fig. 4. It is particularly interesting to note the difference between the arc suppression coil earthed systems and the solid and resistance earthed systems at 11 kV. The fault incidence on the latter is about 2½ times that on the arc suppression coil system. At 33 kV, however, the difference between the systems is not so very marked.

Fig. 5 shows the fault incidence on overhead lines for different kinds of fault. Lightning is the greatest single cause, followed by faults due to "unknown causes." Birds and "objects fouling lines" are next in order.

Lightning. The Board co-operates closely with the E.R.A. in studying lightning phenomena and copies of all fault reports of lightning incidents are sent to them. Discussions with the E.R.A. took place before the Board's fault reporting scheme was finalised, and it should be noted that the fault report form (Fig. 1) includes the E.R.A. pole top diagrams to indicate the type of line construction and amount of earthing. To avoid duplication of effort, only

Fig. 2. Punched card used in the analysis of fault returns



FAULT STATISTICS FOR OVERHEAD LINES AT VARIOUS SYSTEM VOLTAGES

Vertical scales show fault incidence in faults/100 miles/year for various types of fault

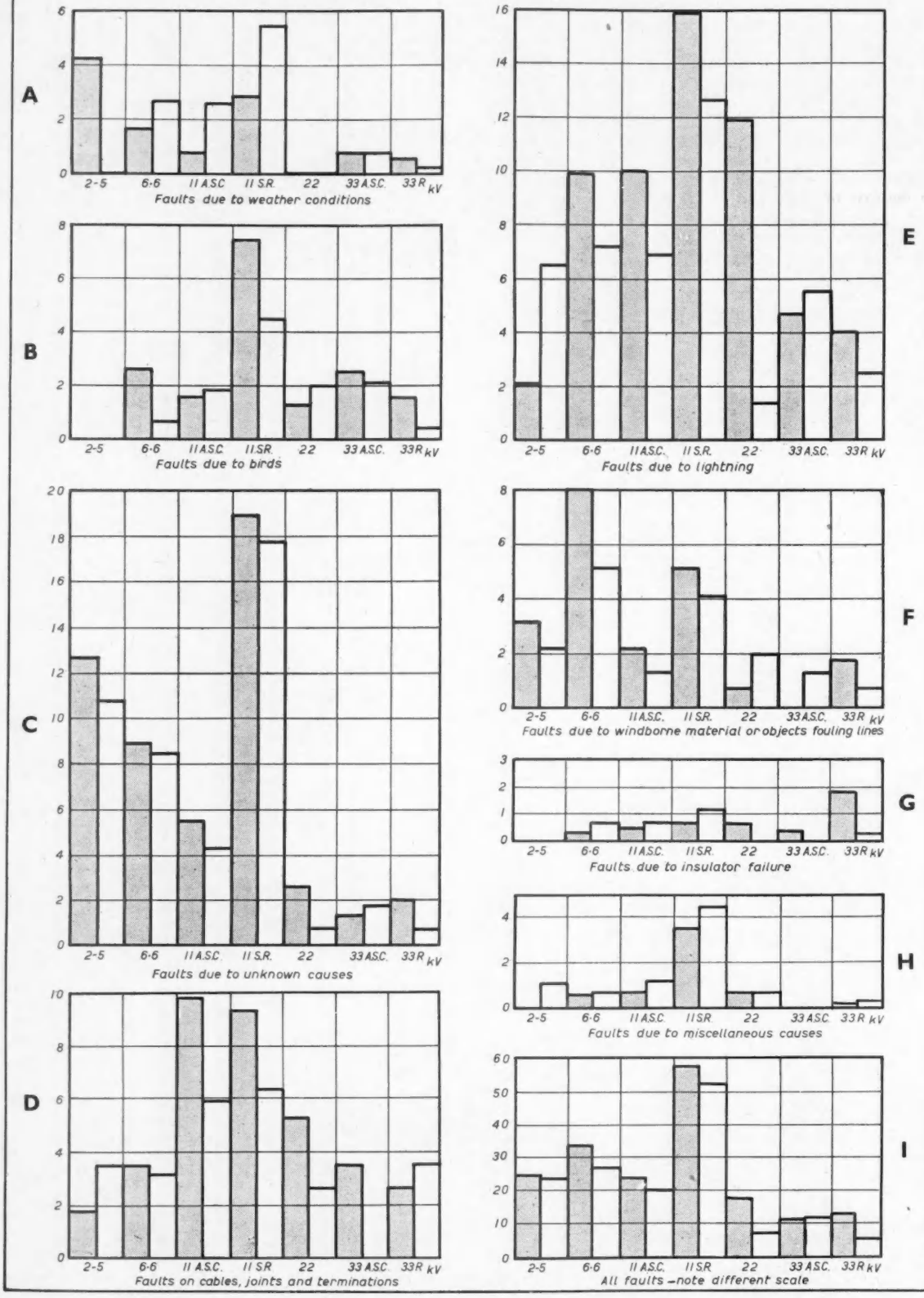
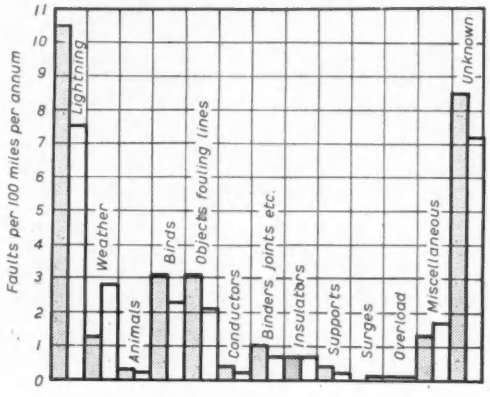


Fig. 4, opposite, sets out the fault statistics relating to overhead lines. One diagram (D), which relates to underground cables and accessories is, included for comparison. For 11 and 33 kV lines, ASC indicates system earthed through arc suppression coil, SR solid and resistance earthed and R, resistance earthed

a limited amount of analysis of lightning faults is carried out by the Board, but a fully detailed report is prepared each year by the E.R.A.

Fig. 4E shows the fault incidence on lines operating at different system voltages. In general, lightning was much more severe in 1952/53 than in 1951/52. The large difference between the two years for 22 kV lines is due to the small mileage, on which a small difference in total number

Fig. 5. Faults/100 miles/year on all h.v. overhead lines



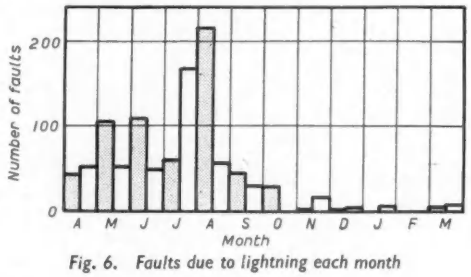


Fig. 6. Faults due to lightning each month

of faults makes a large difference in faults per 100 miles. At 11 kV the ratio of faults on arc suppression coil earthed systems to those on solid and resistance earthed systems is about 1:1·7. At 33 kV, however, there is little difference, although the incidence is higher on the arc suppression coil system. A contributory factor to this, however, is that the bulk of the 33 kV arc suppression coil mileage is in an area where the isokeraunic level is comparatively high.

Fig. 6 shows the number of lightning faults in each

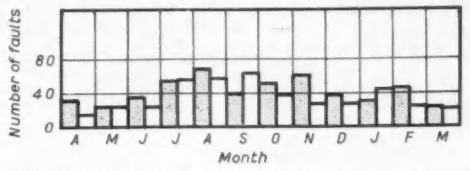


Fig. 7. Faults on o.h. lines due to unknown causes each month

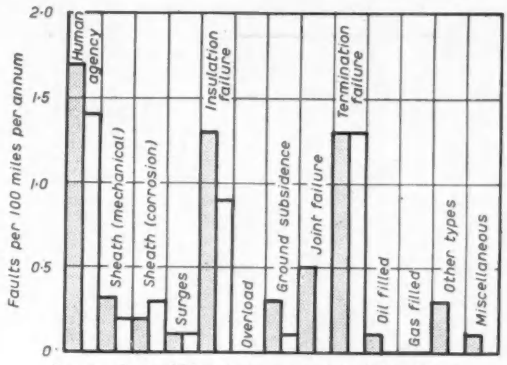


Fig. 8. Faults/100 miles/year on cables (all voltages)

month. It will be noted that during the year 1952/53 over 200 lightning faults were experienced in August and over 100 in both May and June. There is little lightning activity during the winter months.

Weather. The incidence of faults due to weather conditions is shown in Fig. 4A. The floods on the East Coast during the early part of 1953 chiefly affected the l.v. system; the number of h.v. faults was not excessively large.

Birds. Fault incidence due to birds on lines of different system voltages is shown in Fig. 4B. Here, the ratio of faults on arc suppression coil systems to solid and resistance earthed systems at 11 kV is about 1:3·4. At 33 kV the ratio is 2·2:1 against the arc suppression coil; however, five of the six faults due to birds on 33 kV arc suppression coil systems were caused by swans, which are large enough to get between phases.

An interesting point regarding the faults due to birds is that at 11 kV about 40% of them occurred at poles carrying transformers and/or switchgear.

The kind of bird causing the fault was mentioned in about half the reports, and details are given in Table II for the year 1952/3.

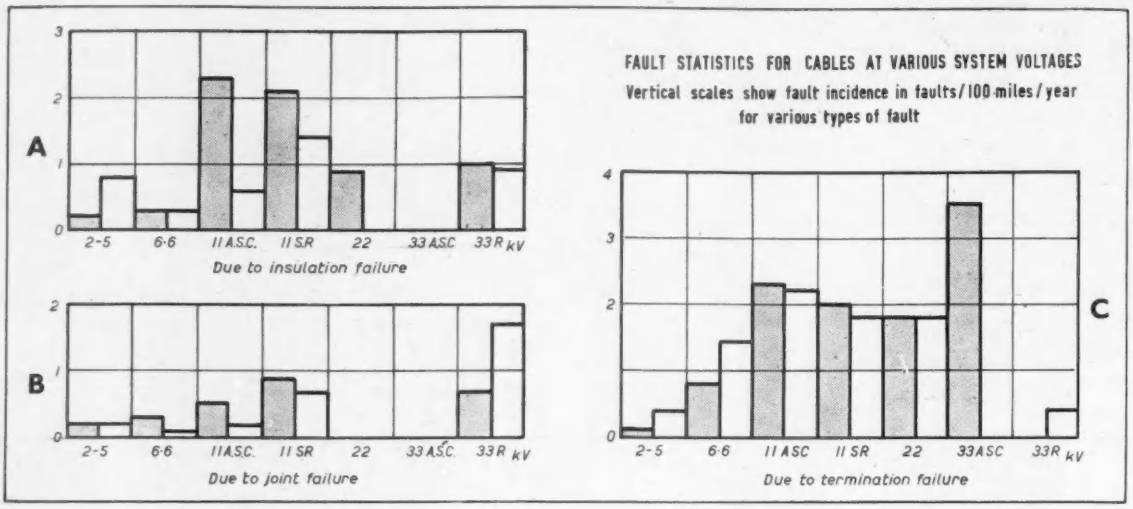
A number of faults were due to the fact that on some transformers the top arcing horn was fitted with an insulating tube or shroud. Birds perched on the lower arcing horn and pecked at insects which had made their nest in these tubes, and so caused flashovers.

Windborne Material and Objects Fouling Lines. Fig. 4F shows the incidence of faults in this category. The objects

TABLE II. KINDS OF BIRDS CAUSING FAULTS ON O.H. LINES.

Bird	6·6 kV	11 kV arc suppression coil systems	11 kV solid and resistance earthed systems	22 kV	33 kV arc suppression coil systems	33 kV resistance earthed systems	Total
Swan	6	11	7	—	5	1	30
Heron	—	3	1	—	—	—	4
Crow	—	5	5	—	—	—	10
Rook	—	5	4	—	—	—	9
Owl	—	—	3	—	—	2	5
Jackdaw	—	—	—	1	—	—	1
Starling	—	—	1	—	—	—	1
Pheasant	—	1	—	—	—	—	1
Pigeon	—	1	—	—	—	—	1

Fig. 9, below, summarises fault statistics relating to cables


FAULT STATISTICS FOR CABLES AT VARIOUS SYSTEM VOLTAGES
Vertical scales show fault incidence in faults/100 miles/year for various types of fault
A
2-5 6·6 11 A.S.C. 11 S.R 22 33 A.S.C. 33 R kV
Due to insulation failure
B
2-5 6·6 11 A.S.C. 11 S.R 22 33 A.S.C. 33 R kV
Due to joint failure
C
2-5 6·6 11 A.S.C. 11 S.R 22 33 A.S.C. 33 R kV
Due to termination failure

concerned in these incidents included those shown in Table III.

Insulator Failure. Fig. 4G shows the fault incidence due to insulator failures at different system voltages.

Miscellaneous. Fig. 4H shows the fault incidence at different system voltages. Most of the faults in this category occurred on pole mounted switch and fusegear, including those shown in Table IV.

No injuries to personnel were reported from the flash-overs during switching. Over half the faults due to failure or deterioration of fuse elements involved fuses rated at 10 amps or less.

Unknown Causes. It will be noted that faults due to "unknown causes" form a very high proportion of the total,

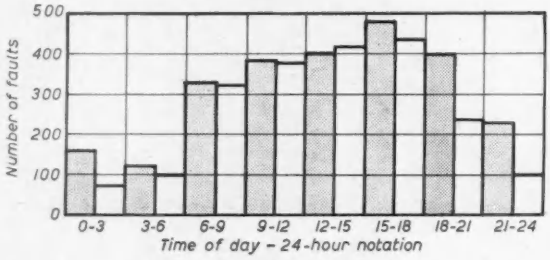


Fig. 10. Diurnal Fault incidence

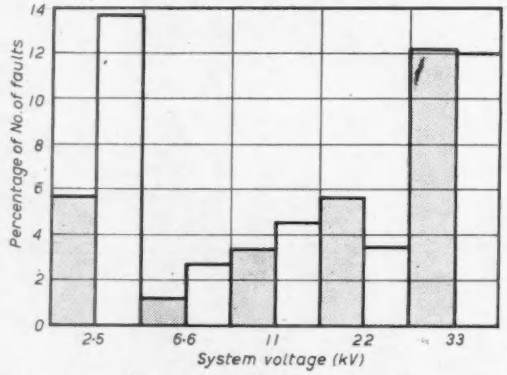


Fig. 11. Percentage of faults occurring during abnormal running conditions

TABLE III. OBJECTS WHICH MADE CONTACT WITH O.H. LINES.

Objects	No. of faults		Objects	No. of faults	
	51/52	52/53		51/52	52/53
Tree branches	69	86	Target towing wire (aircraft) ...	2	2
Trees, during felling ...	—	10	Al. foil from aircraft	3	1
Rotten tree falling	—	1	Parachute, etc., from aircraft ...	—	1
Straw	5	33	Iron sheet, wind-blown	—	1
Cranes... ...	7	11	Chicken house roof	—	1
Excavator ...	3	8	Kites	6	5
Dragline ...	—	6	Wire thrown over conductors ...	6	5
Dredger ...	3	1	Stone from catapult	—	1
Farm elevator	1	1	Balloons from fete	—	1
Aircraft colliding with lines ...	5	4	Meteorological balloon ...	1	—
			Football hitting jumper ...	2	—

being second only to lightning. In this connection, it is insisted upon that unless there is evidence to place the cause of the fault definitely in one of the other categories, the cause of the fault should be stated as "unknown." On an overhead line system, there are bound to be many faults whose causes cannot definitely be ascertained, as straw and tree branches, etc., blown on to the line by high winds, can equally well be blown off again before the patrol arrives; and also, during the summer months, standing crops prevent patrols discovering such things as birds, etc. In these cases, it is considered preferable to have a large number of "unknown causes" faults rather than to have guesses made of the probable cause.

Fig 4C, which shows the fault incidence at different system voltages, is however, very instructive. It will be seen that, at 11 kV, the ratio of faults due to "unknown causes" on arc suppression coil systems to those on solid and resistance earthed systems is about 1:3·7; and also, except for the 11 kV solid and resistance earthed systems, the fault incidence decreases with increasing voltage. In 1952/53, 158 of these faults were cleared by circuit-breakers and 339 by fuses. Of the fuses involved, 54 were rated at 10 amps or less and 106 at 15 amps or less.

The number of "unknown causes" faults in each month is shown in Fig. 7.

Cables

At the end of 1952/53, the approximate mileage of cables at the various system voltages was as shown in Table I. The fault incidence on cables at the different system voltages is shown in Fig. 4D, which is included with the o.h. line diagrams for comparison, while Fig. 8 shows the incidence of faults of the different categories.

At 11 kV there was little difference between the fault incidence of the arc suppression coil and the solid and resistance earthed systems. At 33 kV the arc suppression coil mileage is insufficient to permit drawing conclusions.

It will be seen from Fig. 8 that the greatest hazards to cable installations are faults due to human agency, which are faults caused by damage to the cable during street excavations, etc. These outnumber the faults due to insulation failures and termination failures, which are the next most serious causes of faults.

Of the faults with mechanical damage to the sheath, in the year 1952/53 those caused by human agency included 38 faults on armoured cable and 44 faults on unarmoured cable. Those due to other causes than human agency included two faults on armoured cable and 11 faults on unarmoured cable. These figures should be used with caution, however, as the mileages of the respective types are not available.

TABLE IV. CAUSES OF FAULT INCIDENTS ON POLE MOUNTED SWITCH AND FUSEGEAR.

Cause of fault	No. of faults	
	1951/2	1952/3
Mechanical failure or deterioration of fuse element	32	15
Contact deterioration	20	8
Broken insulators on switch fuse	8	21
Broken copper braid	2	3
Broken glass tube	4	7
Bolt sheared	3	1
Fuse dropped out	4	7
Flashover during switching	4	7
Arcing horn out of adjustment	—	1

TABLE V. FAULT INCIDENCE DUE TO CABLE INSULATION, 1952/53.

Type of cable	Faults per 100 miles per annum	
	11 kV arc suppression coil earthed systems	11 kV solid and resistance earthed systems
Earthed type cable ...	2·62	2·76
Unearthed type cable	1·9	0·74

Insulation Failures. Fig. 9A shows the fault incidence due to cable insulation failures. At 11 kV of cables to BS 480 there were approximately 454 miles of earthed type and 420 miles of unearthed type on arc suppression coil systems; there were also 941 miles of earthed type and 676 miles of unearthed cable on solid and resistance earthed systems. During the year 1952/53 the fault incidence due to cable insulation failure on these systems was as shown in Table V.

Again, it should be borne in mind that these figures refer to one year only. Of the 33 kV cable faults, in one case, examination showed that the base of the trench was irregular, apparently the earth filling had not been sifted. One of the other 33 kV cable faults occurred on some cable supplied in 1928 and another on some supplied in 1925.

Joint Failures. The incidence of joint failures at different system voltages is shown in Fig. 9B.

Termination Failures. The incidence of cable termination failures is shown in Fig. 9C. The types of cable termination concerned in these faults in the year 1952/53 are listed in Table VI.

Oil Filled Cables. One of the two failures on 33 kV oil-filled cables was due to oil duct leakage at the foot of a small wipe on the oil side of a stop joint. The low oil pressure alarm operated.

The other fault was due to failure of the inner lead sheath. The oil level was observed to be falling steadily so the outer sheath was removed and oil was seen to be leaking through a small crack in the inner sheath.

Other types. 14 breakdowns occurred on cambric insulated lead-covered cables in kiosks. Most of these occurred within a very short period of each other and in periods of extremely hot weather. It was concluded that the trouble resulted from the entry of moisture at the ends of the cable, leading, over a period of years, to severe deterioration of the insulation.

Miscellaneous. One of the faults in this category occurred when concrete supports carrying 33 kV cables heeled over, and allowed the cable armouring to come into contact with a steel pylon carrying overhead d.c. conductors. This provided an alternative return path for neutral currents and allowed arcing to occur with consequent severing of the cable armouring.

Transformers

About 60 faults in each year were caused by transformer failures, this being equivalent to 0·4 faults per 100 transformers per annum. The majority of these faults were on h.v./l.v. transformers. Faults on h.v./h.v. transformers over the two years included four winding failures and five failures of tap change gear. One winding failure, one tap change gear failure, and one case of low oil level were

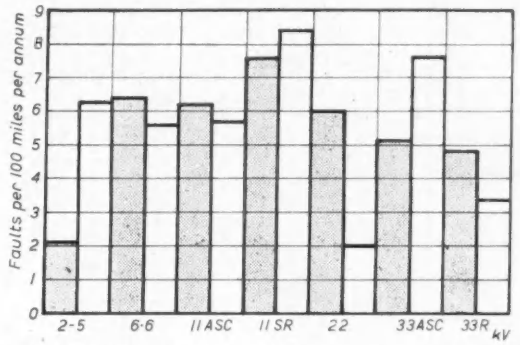


Fig. 12. Faults/100 miles/year on o.h. lines at various voltages which resulted in permanent damage to equipment

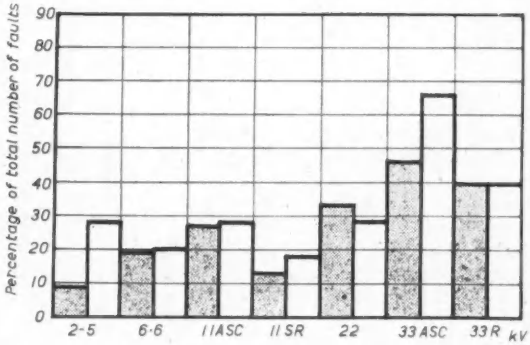


Fig. 13. Percentage of faults on o.h. lines at various voltages which resulted in permanent damage to equipment

cleared by the operation of Buchholz relays.

Winding failures accounted for most of the faults on h.v./l.v. transformers, the fault incidence on 11 kV/l.v. transformers due to this cause is shown in Table VII.

There have been 8 instances of transformers being damaged due to overloads, all involving pole mounted h.v./l.v. transformers.

Switchgear and Protective Gear

Serious failures of circuit-breakers are fortunately very rare and most of the faults due to circuit-breakers are concerned with the tripping or closing mechanisms. Six cases of "insulation" failure on circuit-breaker units occurred in each of the two years, fortunately without serious results. Some 25 faults were due to failures of metalclad fusegear in 1951/52 and 30 in 1952/53. Of these, the majority were mechanical failures or deterioration of the fuse elements.

Faults caused by protective gear failures included those shown in Table VIII.

Miscellaneous Faults

Faults classed as "Miscellaneous" are generally those which do not originate in the h.v. distribution system itself and in the two years under review included the instances summarised in Table VIII.

"Switching Errors" are operations of the wrong switch when a switching operation was intended. "Human Errors"

TABLE VI. CABLE TERMINATIONS CONCERNED IN FAULTS DURING 1952/53.

Indoor Cable Boxes;		*Outdoor Cable Boxes;*	
Link Pillars	2	Outdoor type trifurcating boxes... ...	2
Cable boxes on swgr.	6	Cable boxes on swgr. ...	3
Cable boxes on transformers	2	Cable boxes on transformers	11
Cable boxes on kiosks	2	*Pole Boxes*	35

TABLE VII. WINDING FAILURES ON 11 kV TRANSFORMERS.

Types of Transformer	Faults/100 transformers/year	
	11 kV a.s.c.	11 kV s.r.
Indoor transformers	—	0·32
Outdoor transformers	0·19	0·16
Pole mounted transformers ...	0·32	0·21
Total	0·27	0·23

a.s.c.—arc suppression coil systems; s.r.—solid and resistance and earthed systems

are mistakes or inadvertent actions which result in a circuit-breaker tripping when no switching operation was intended. Bearing in mind that well over 20,000 switching operations are carried out in the area in each year, the above is not considered unsatisfactory.

With one or two exceptions the "Faults on l.v. System" appear in the h.v. fault analysis because of incorrect discrimination between h.v. and l.v. protection of transformers. Most of these faults involved the operation of h.v. fuses, the fuse ratings concerned being shown in Table VIII.

Fig. 10 shows the total number of faults which occurred in each 3-hour period of the day for each of the two years. The "peak hours" for faults are between 15.00 and 18.00 hours. In Fig. 11 is shown the percentage of faults occurring during abnormal running conditions, this is, when parts of the system are already out on account of maintenance or because of earlier faults. On the 33 kV system, about 12% of faults occurred during such conditions in both the years under review.

Fig. 12 shows the faults per 100 miles per annum on overhead lines of different system voltages which resulted in permanent damage to equipment. Fig. 13 shows the percentage of faults on overhead lines which resulted in permanent damage to equipment. Here the difference between the two figures in respect of 11 kV systems is interesting. One disadvantage often quoted against the arc suppression coil is that damage to equipment is more often caused on such systems than on solid or resistance earthed systems. While Fig. 13 shows that this is correct, for the two years covered by this analysis, when expressed as a percentage of the number of faults which occur, Fig. 12

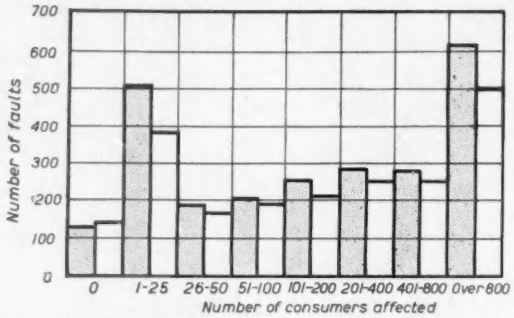


Fig. 14. Number of consumers affected by faults

shows that it does not hold when expressed in terms of faults per 100 miles of line per annum.

The number of occasions on which various numbers of consumers have been disconnected through faults is shown in Fig. 14. This takes no account of the duration of the interruption, and of course switching makes it possible to restore supplies to all or the majority of the consumers within a very short time. Quite a number of the faults involved no interruption of supply, while a large proportion, as might be expected on an extensive rural system, involved the interruption of supplies to small numbers of consumers only.

Conclusions

The number of faults in the current year is so far running somewhat less than in the two previous years so that it appears that the fault incidence during the year 1952/53 might be above average. The value and reliability of these fault statistics will increase as additional years iron out the

TABLE VIII. MISCELLANEOUS FAULTS.

Type of fault	No. of faults	
	1951/52	1952/53
Protective Gear—Causes of Fault		
Faulty relay	4	6
Unsuitable characteristic, etc.	6	2
Time limit fuses	6	5
Vibration	3	3
Pilot cables	1	3
Miscellaneous Faults...		
Bulk supply failures	16	12
Fault on consumers' installation ...	39	44
Human error	19	17
Switching error	10	13
Fault on l.v. system	103	101
Overload	71	64
Ratings of h.v. fuses operating for h.v. faults		
5 amp and under	16	7
6 to 10 amp	24	14
11 to 15 amp	6	15
16 to 20 amp	19	16
Over 20 amp	20	12

effect of these annual fluctuations. As it is, however, it is interesting to note that in general the difference in the total number of faults in the two years does not affect in any marked degree the relative fault incidence on the various systems. As remedial measures, such as the conversion of some of the solid and resistance earthed overhead systems to arc suppression coil earthing, replacement of obsolete switchgear, review of fuse sizes, etc., are put in hand it is anticipated that the annual fault incidence will show a considerable reduction.

The author wishes to thank The Eastern Electricity Board and Mr G. N. Green, M.I.E.E., Chief Engineer, for permission to publish this article, and also his colleagues for their helpful advice and assistance.

Electric Drive for a Finishing Mill

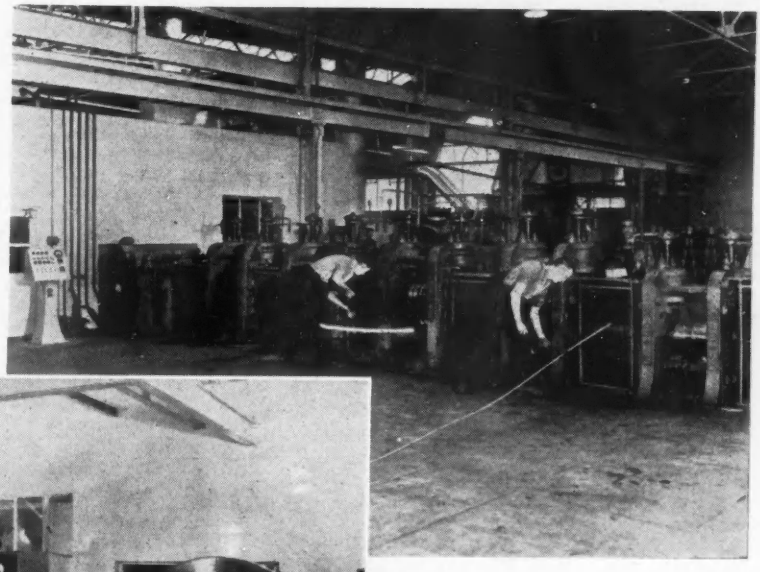
THE British Thomson-Houston Co. has recently commissioned the electrical drive for a 10 in. finishing mill installed in the Sheffield Works of Messrs Swift Levick and Sons Ltd., who are manufacturers of highly alloyed steels of all types.

The mill, which has been designed and built by the Brightside Foundry and Engineering Co., Ltd., is for producing high quality steel. It consists of a 10 in. bar mill of five stands, three stands consisting of 3-high rolls, with two stands of 2-high rolls for the finishing passes. The mill is driven through a gear box, with flywheel running at motor speed, by a 350 h.p., 350/840 r.p.m. d.c. motor.

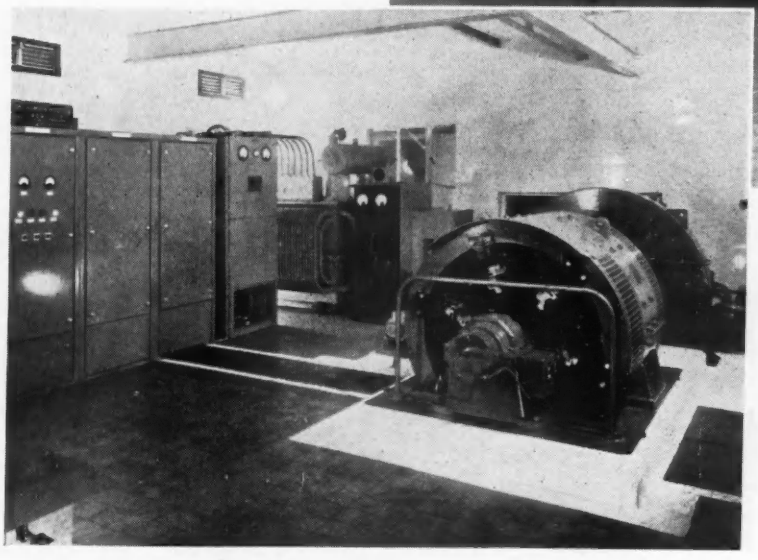
The incoming supply to the motor house is fed through 750 amp distribution switchgear and a 280 kW transformer to a B.T.H. six-anode pumpless steel tank rectifier. An 800 amp circuit-breaker is incorporated in the rectifier cubicle for the outgoing d.c. supply.

The main control panel is enclosed in sheet steel cubicles and, in addition to the main drive section, includes control for pinion oil, gear oil and Farval lubrication system. A comprehensive alarm system is incorporated to give visible and audible warning of loss of oil pressure, cooling air or high bearing temperature. The mill is controlled from an operator's control pedestal which is situated adjacent to the first mill stand.

The roll trains of the mill are cut to cog roll from a 3 in. billet and to finish roll round bars ranging from $1\frac{3}{4}$ in. to $\frac{1}{4}$ in. diameter. Similar ranges can be rolled in squares, hexagons and flats. The main purpose of the mill is to roll bars of expensive, highly alloyed steels, such as high-speed steels, stainless and heat resisting alloys, high nickel alloys and magnet steels. Accuracy of dimensions is of paramount importance and the design of the stands and bearings has been directed towards providing maximum rigidity.



Above; mill stands with control pedestal standing on the left of the picture



Main mill motor and control room showing mill motor contactor gear and rectifier equipment are seen on the left

notes on wiring

by Megohm

I HAVE, and no doubt many installation engineers have, viewed with some concern the increase in the display and sale of cheap electrical accessories in the multiple stores. Combined with the rather high costs of installation by competent electricians, this in turn is leading to an increase in the activities of the amateur wireman. When faced with the need for a new switchsocket for his television set, etc., the householder purchases a piece of flexible and socket from one of the above mentioned stores and proceeds to do the job himself. It does not require much thought to realise what danger this may lead to.

I do not know of any legal means of restricting the sale of such shoddy articles, and the cure appears to be in the hands of the operatives themselves, by explaining to their friends the dangers of amateur wiring in houses. Insurance Companies could also assist by insisting that the houses covered by them were correctly wired. Electricity Boards could tighten their regulations also. All accessories are dealt with in the I.E.E. Regulations and I feel that a little time spent on looking at these is indeed well spent. A general rule which covers all accessories states that "Every accessory shall be of such a size that its current rating is not less than the maximum current which will normally flow through it" (Regulation 601).

Ceiling Roses and Flexibles

Ceiling roses may be of the two or three plate type and made of porcelain or bakelite. The three plate type enables the live wire to be looped at the ceiling rose instead of at the switch, thus a saving in cable is effected. With a tough rubber sheathed wiring installation it is possible to eliminate the use of bakelite joint boxes. It is important that correct use is made of the arrangements for gripping the flexible in ceiling roses. I have seen many instances of these being ignored entirely and a large knot formed in the flexible inside the cup of the cover in order to support the weight of the shade. Incidentally, no more than *two* flexible cords may be connected to any one ceiling rose unless the ceiling rose be specially designed for multiple pendants (Regulation 602B). I can visualise some upward glances in many offices at this moment.

For the conduit system of wiring, semi-recessed ceiling roses are usually fitted, these being screwed direct on to a standard conduit box. Where the box is set flush into the ceiling, a break joint ring is fitted to ensure a neat finish. No ceiling rose may be used on a circuit having a voltage normally exceeding 250 V (Regulation 602B). The bakelite type of ceiling rose requires a little more care when fixing and I well remember learning this lesson during my apprentice days. When fixed on wood blocks care should be taken to ensure that no undue strain is placed on the base by screws being driven in out of alignment. I am quite certain that the type of bakelite ceiling roses sold by these multiple stores would suffer mechanical damage when being fixed even by the most competent electrician.

Bad installation and bad maintenance of flexible cords can lead to fire and shock. I know that many householders renew flexibles themselves in order to cut costs, but all too often the result is such that the deterioration is more rapid than before. Here again I see that inferior flexible is easily obtained and although the cable reels bear numerous references, these mean nothing to the initiated. It is also important to study Regulation 605B, which sets out the maximum weight to which flexibles shall be subjected. Where a weight of more than 10 lb has to be supported other means of support shall be arranged or, alternatively, two or more flexible cords shall be used. It is rather surprising just what weight certain flexibles are subjected to, and I have often walked around a fitting rather than underneath it. Flexible cords must be related to size of fuses. If, for instance, a pendant consisting of 14/-0076 flexible cord is connected to a circuit designed and fused to carry 15 amps and a 15 amp heater is then connected to the flexible, the flexible cord would get dangerously hot. I have known instances of such heaters being connected to lampholders, and one which comes readily to my mind was during a cold spell of weather. The person concerned discovered his tank had frozen and decided to thaw it out by means of an electric fire. The flexible to the fire was not long enough so he used a table lamp and flexible between the 15 amp switchsocket and end of the fire flexible, and the result was a large scorch mark on the carpet where the light flexible had heated up.

Insulated type lampholders should be used wherever possible and again care taken to ensure that the flexible is correctly gripped. Lampholders fitted with switches must also be controlled by a fixed switch or socket sited in the same room. In bathrooms and other positions where stone floors exist all lampholders should be fitted with insulated skirts to prevent inadvertent contact with the lampholder pins when the lamp is being renewed (Regulation 1002C). Ordinary bayonet-cap lampholders must not be used on circuits where the fuse protecting the circuit exceeds 15 amp rating (Regulation 606C).

The outer screwed contact of E.S. type lampholders must always be connected to the neutral wire of the circuit (Regulation 606C).

Switches

So many types of switches are available on the market today that I find it impossible to deal with them all. I consider all I need say is that once more cheap and nasty types are readily available, and their construction leaves much to be desired. The cheap bakelite models are particularly repulsive to the trained engineer, for their construction is of near egg-shell thickness and their contacts weak and easily distorted.

I think many engineers will agree with me that the continued sale of these inferior goods must be discouraged as must the work of the amateur wireman. I cannot, without giving the matter some very serious thought, offer any certain method of doing so, but repeat that most of the cure lies in the hands of the trained electrician.

Sir Charles Parsons

— engineer, scientist and mathematician

THIS year sees the centenary of the birth of one of Britain's most versatile and prolific engineers, Sir Charles Parsons. Although his fame mainly rests on his work in connection with the development of the steam turbine, his activities in other fields of mechanical and electrical engineering as well as in pure and applied science played no small part in industrial and commercial developments at the beginning of the century.

Charles Algernon Parsons was born in London on 13th June 1854, and was the son of the third Earl of Rosse, himself a distinguished engineer and astronomer, and one-time president of the Royal Society. In 1873, Parsons proceeded to St. John's College, Cambridge, where he graduated in 1877, passing out as eleventh wrangler. Then followed a period of apprenticeship with Sir William Armstrong and Co. at Elswick Works, Tyneside, and with Kitson and Co., Leeds. He became, in 1884, junior partner in the Gateshead works of Clarke, Chapman and Co., taking charge of the newly-formed electrical department of that company. It was during this period that he concentrated on the development of the practical steam turbine, which he achieved by the principle of compounding; allowing the steam to expand through a series of steps in successive rows of fixed and moving blades, thus making the pressure drop between stages only sufficient to permit moderate steam velocities. The secondary principle of "reaction" —allowing the steam to expand in the moving blades as well as in the fixed—has remained a characteristic of Parsons turbines since that date.

In 1889, he formed the firm of C. A. Parsons and Co., at Heaton, and, aided by friends, founded the Newcastle and District Electric Lighting Co. which began operations in January 1890 with a pair of 75 kW turbo-alternators. The new prime mover still failed to arouse general interest and Parsons had to accept financial risk in companies formed to supply electricity to Cambridge in (1892) and Scarborough (1893) to give them sufficient confidence to install turbo-electric plant. Progress was then rapid. By 1900 generating sets of 1,000 kW capacity were being built, while in 1912 he undertook the construction of a 25 MW unit for Fisk Street Power Station, Chicago.

In 1884, Parsons had considered marine propulsion as his original patents of that year showed, but it was not until 1894 that a direct attack was made on the problem and the Parsons Marine Steam Turbine Co. established at Wallsend-on-Tyne. Work here had its first fruits in the building of the historic *Turbinia*, which caused a major sensation at the great Naval Review of 1897. As a consequence, two further ships, the *Viper* and *Cobra* were ordered by the Admiralty, but were lost at sea by accidents quite unconnected with the propulsion machinery, and the Admiralty temporarily ceased to take interest. The Merchant Service, however, took the turbine more seriously and several vessels were powered by this means. In 1902, however, orders were placed by the Admiralty for four 3,000 ton cruisers, one of them to be turbine propelled, and so successful was this ship, the *Amethyst*, that in 1905 it was agreed that in future turbine machinery should be used in all classes of warship.

With the application of turbines to the slower vessels, problems of reduction gearing arose and these were successfully solved by the development of the creep table for producing accurately cut gears. This table permitted the even distribution of errors in the master gears on to the finished gear wheels.

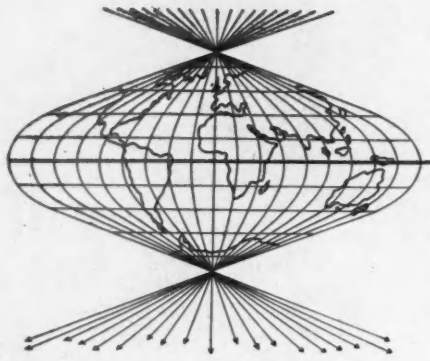
Electricity Supply

The growth of electricity supply, consequent on the invention of the turbo-alternator, created a need for higher transmission and generation voltages. Ferranti had given a lead with the large slow-speed alternators to generate single-phase a.c. at 10 kV at Deptford, but the majority of sets in the early days generated at about 2 kV. The first real advance was made by Parsons in 1905 when he supplied a pair of 1,500 kW turbo-alternators generating at 11 kV to the Frindsbury Power Station of the Kent Electric Power Co. The increase in transmission voltages, however, led Parsons in 1928 to produce a 25 MW set designed to generate at 36 kV and this was installed at Brimsdown in the same year. For more than a generation Parsons led the way in most branches of power station development. He experimented with steam re-heating as far back as 1900, introduced the steam air ejector, and improved the thermodynamic cycle by the application of Mr James Weir's 1876 proposal to heat feed water by bled steam.

Other Activities

His other activities were wide and numerous. He played an important part in the development of searchlight mirrors and in optical work and the firm of Sir Howard Grubb, Parsons and Co. have been responsible for numerous astronomical telescopes, and other precision scientific instruments. One of their more recent products was the 74 in. reflecting telescope exhibited in the Dome of Discovery at the Festival of Britain. The problem of cavitation erosion on propellers occupied much of his time, as did also the manufacture of diamonds—probably the only one of his failures. He devised in 1885 methods for the manufacture of incandescent lamps, and constructed in 1893 a steam-driven helicopter which he later converted into a monoplane capable of rising 20 ft and flying 80 yards.

He died in 1931, having lived to see the practical supercession of the reciprocating engine by the steam turbine in the power field. His genius was recognised by his appointment as C.B. in 1904, and K.C.B. seven years later. Subsequently he was admitted to the Order of Merit. He was awarded both the Faraday Medal and the Kelvin Medal.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Diesel Plant for B.C.

Plans for increasing the capacity of its 19 diesel generating stations are announced by the British Columbia Power Commission. An additional 1,000 kW generator is to be installed at each of the Quesnel, Williams Lake and Terrace stations, and a 1,136 kW opposed-piston Fairbanks Morse unit is to be added at Burns Lake. The plans provide for the transferance of some smaller sets to three other stations including a new one at McBride, east of Prince George, where a new distribution system is shortly to be energised.

Trade Outlook

Canada must change her trade policies or revert to a 50 cents an hour economy, Mr O. W. Titus, president of the Canadian Electrical Manufacturers Association, told Eastern Ontario Development conference delegates recently. He said Canadian electrical manufacturers were prepared to meet the world or any part of it on their ability to compete per man-hour. But there was a limit to the premiums they could pay when cheap labour goods were freely admitted to domestic markets. Competing British and European countries had basic labour rates well below 50 cents an hour, and a 48-hour week was common. Exchange and fiscal policies also worked against Canada, the net effect being that her export markets for manufactured goods were disappearing, or were down to negligible proportions. That loss had the effect of raising costs for her remaining production, he alleged.

Power for Metallurgy

Plans for the employment of Yukon-British Columbia power for metallurgical development in Canada's North-West, are emphasised in the annual reports of Ventures Ltd., and Frobisher Ltd., holding companies with large interests in mining concerns. It has been estimated that 4,500,000 h.p. can be developed economically by diverting into the Taku River water from the upper Yukon, the Dezadeash and Salmon Rivers and that ultimately 5,000,000 h.p. can be developed. Two subsidiaries have been formed, Northwest Power Industries and Yukon Metallurgical Industries, to carry out the plans. It is stated that Northwest Power Industries is to develop hydro-electric energy on the Taku and utilise it in metallurgical and electro-chemical reduction in the vicinity of the power plant. Yukon Metallurgical Industries would utilise a considerable part of the power in the Yukon on zinc, lead and other metal refining. It is planned to erect two units on the west coast near established power sources as soon as plans can be finalised. The first would have as its objective 100 tons a day of iron or steel, with the second unit to treat cobalt concentrates.

AMERICA

The Last Battle?

The United States Supreme Court has removed the last legal barrier to the construction by the New York State Power Authority of its share of the St. Lawrence River power project. The Court refused to act on an appeal which contested the right of the State of New York to act with the province of Ontario in the joint construction of the scheme at Long Sault Rapids, on the international section of the St. Lawrence. The court's decision also clears the way for the start of work on the Seaway part of the project which, though not directly involved in the appeal, was really dependent on the favourable issue of the power question.

SCANDINAVIA

Discussion on Exchange

The possibility of Norway exporting hydro-electric power to Sweden and other countries was the subject of discussion in the Norwegian Parliament recently. Government speakers made it clear that the various co-operation projects considered at talks in Stockholm a short while ago would be carefully studied and detailed proposals submitted to Parliament in due course.

MIDDLE EAST

Revised Plan

A new scheme to irrigate more than 1,000 sq miles of four Middle East countries and provide hydro-electric power, has been submitted to Mr Eric Johnston, the Israeli Foreign Minister has revealed. Under the new scheme it is proposed to integrate the surplus waters of the Litani River which flows through Lebanon, with the Jordan and Yadmuk rivers to benefit Israel, Jordan, Syria and Lebanon. The whole plan, which would also provide power generation at an annual rate of 1,400 million units annually, is designed to be put into effect in stages over a 25 year period. Its total cost is estimated at $470 millions.

AFRICA

Bulk from Uganda

Subject to final government approval, the East African Power and Lighting Co. has completed arrangements with the Uganda Electricity Board to take a bulk supply from the latter's Owen Falls hydro-electric scheme. It is expected that a supply of up to 43,500 kW will commence in 1957, Major C. M. Taylor, the chairman of the East African Power and Lighting Co., has announced. For the purpose the latter company has formed the Kenya Power Co., Ltd., which is to apply for the necessary bulk supply licence, and will finance and construct the necessary transmission lines. It is also proposed that this new Kenya company shall purchase at book value the Wanji and Tana hydro-electric stations together with the associated transmission lines to Nairobi. It is felt that this arrangement will assist in the better integration of the generating units with the bulk supply from Uganda and so improve the supply to Nairobi both economically and technically.

Escom's New Station

The Wilge power station of the Electricity Supply Commission of South Africa is expected to be in operation in August next. The site of the Wilge station, near Witbank, is 5,100 ft above sea level. The first section will comprise two 30 MW turbo-generators and four spreader-stoker type 150 klb/hr boilers.

More Water Power

The hydro-electric plant at Grandes Chutes in French Guinea was inaugurated a short while ago. Begun in 1951 by the Societe Energie Electrique de Guinee at Conakry, the plant is intended to provide power for the Kaloum iron ore and Kassa bauxite areas in addition to supplying electricity to the towns of

Conakry and Kindia. The initial capacity is 9,000 kW consisting of two Francis turbines, but plans provide for the doubling of output at a future date. The project has entailed the construction of a barrage 470 metres long.

A New H.Q.

Johannesburg's tallest building, Escom House, the home of the Electricity Supply Commission of South Africa, has been sold to African Life Assurance Society Ltd., at a price of £800,000, we learn. The 21-storey building, which is 236 ft high, was opened by General Smuts in 1937. The Electricity Supply Commission has already purchased another site in Johannesburg on which to erect a new building which will be about 50% larger than the present accommodation.

S.W. ASIA

Wind-Power Survey

The Wind-Power Sub-Committee of the Indian Council of Scientific and Industrial Research are conducting experiments in Rajasthan to determine the suitability of sites for the erection of windmills. These experiments are likely to be a prelude to investigations on a much larger scale embracing the whole of India. In charge of the work is Dr P. Nilakantan, who has just completed a survey of the suburbs of Jodhpur city. While the primary consideration in arid regions having moderate winds will be pumping of water for domestic and irrigation purposes, a major aspect of the all-India programme would be selection of wind-power sites for installation of large wind-electric generators of over 1,000 kW. This would be an economical proposition at places where average annual wind velocity is of the order of 20 miles per hour and more, it is stated.

Another Scheme

The Government of the Sind Province, Pakistan, are now working out details of the Kalri-Lakha hydro-electric scheme which envisages the generation of over 10,000 kW of power. It is estimated to cost over Rs. 17½ millions and on completion will provide cheap electricity for the Hyderabad and Sukkur areas.

AUSTRALIA

Adelaide's New Supply

As a preliminary to Adelaide getting a power supply from the new Port Augusta generating station this winter, work has been started by the Electricity Trust of South Australia in stepping up to 132 kV the two new transmission lines which have been erected. Tests have begun on the Port Augusta to Port Pirie section, and will be followed by similar work on the Port Pirie to Adelaide section. Progress on the Port Augusta power station has reached the stage where the first of the three 30 MW turbo-generators is about ready for operation.

Melbourne's Results

Over 244·5 million units were sold by the City of Melbourne electricity supply undertaking during the twelve months ended 30 Sept. last, an increase of 13%. The undertaking has already built up a very useful water heating load—over 3 million units being sold for that purpose during the year at a price of 0·882d. p.u., and attention is now being devoted to the use of off-peak thermal storage space heaters. Offering a tariff with a unit charge of 0·825d., over 2 million units were sold by the undertaking for that purpose during the year, compared with 4·2 million for conventional radiators at an average price of 4·71d. p.u. The Electricity Department's accounts show a surplus of £59,936 for the year after allowing all charges, including interest, depreciation, etc., but of that figure £45,000 is allocated as a contribution to the Town Fund.

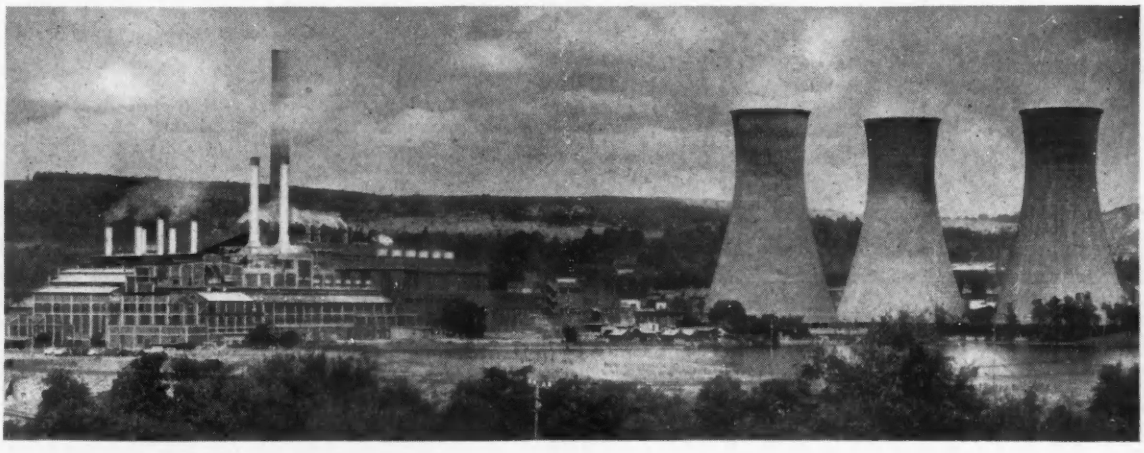
Subsidising King Island

Replying to criticism of charges for electricity in King Island, the Premier of Tasmania, Mr Cosgrove, said that when the proposal for generating electricity at King Island was first considered the State Hydro-Electric Commission was assured that residents required a supply even at the higher tariffs than at first contemplated. To help consumers on King Island, the Government met the annual deficiency, which at 30 June, 1952, was £1,866 and at 30 June, 1953, £3,007. This represented a subsidy of about £20 a consumer a year. The fact that a number of extensions were being sought at present, was proof that King Island people appreciated what was being done for them. Earlier it was stated that in one case a household bill amounted to more than £40 for supply, which would have cost North-West coast consumers £7 to £9.

KOREA

Order for Plant

Further to our note on 20 May regarding South Korea's power needs, we now learn that the South Korean Government has placed a contract with an American concern for the construction of three thermal power stations. It seems that these stations are to be sited at Masan, Samchok, and on the outskirts of Seoul, as we earlier noted. The contract calls for the use of $30 millions in Foreign Operations Administration Funds and $4 millions in South Korean Government funds. The Foreign Operations Administration has also agreed to provide about $3 millions for the rehabilitation of the hydro-electric plant at Hwachon, a few miles behind the present buffer zone.



At Pretoria, in the Transvaal, there has been tremendous industrial development in recent years, necessitating a substantial increase in the City Council's generating plant capacity. The present stage of the Pretoria "A" and "B" power stations is shown in our photograph below. In the "A" station, completed in 1949, there are five generators, aggregating 69,975 kW in capacity, the manufacturers being English Electric (1), Parsons (2), B.T.H. (1) and one Belliss and Morcom turbine with G.E.C. alternator. There are eight Yarrow 100 klb/hr boilers and one 60 klb/hr Babcock and Wilcox boiler. The "B" station at present consists of three English Electric 30 MW sets and six Yarrow 210 klb/hr boilers steaming at 650 lbs/sq in., 850° F. One further 30 MW set and another Yarrow boiler are on order for commissioning in 1957, and the completed station is planned to have six 30 MW units with ten 210 klb/hr boilers. In the circulating water system a dam provides a surface area of 35 acres, there being three cooling towers, 260 ft in height each with a maximum capacity of 3 million gal/hr. An additional tower will be erected for the completed station. Make-up water for the cooling towers is filtered sewage effluent. This water is treated with chlorine manufactured at the power station

Personalities IN THE INDUSTRY

British Insulated Callenders' Cables Ltd. have appointed **Mr J. S. Makin** as branch manager of their Manchester office. Joining the old British Insulated and Helsby Cables Ltd. in 1921 as assistant in the testing section of the Contract Department at Prescot, Mr Makin became assistant engineer on power transmission construction in 1926 in which capacity he was concerned with both underground and overhead installations including 132 kV grid line construction work. From 1950 until his new appointment he was attached to the Home Sales Department at Middlesbrough branch office.

Mr J. S. Makin

Mr V. J. Chalwin

Mr A. P. Quarrell

Mr H. B. Keenan, M.I.E.E., A.M.N.Z.I.E., engineer-manager to the Wairarapa Electric Power Board, New Zealand, is now in this country, we understand. He expects to return to New Zealand in November.

The British Driver-Harris Co., Ltd., have appointed two additional directors, **Mr William Eyers** and **Mr Leslie Rowden Matthews.** The appointments are with effect from 1 June. Mr Eyers joined the Company in 1921 as laboratory boy. After eighteen months, upon the inauguration of an Electrical Testing Department, he became a tester on the wire side and later was given control of experimental work. Between 1928 and 1948, Mr Eyers acted as technical aide to the Sales Department and as a technical salesman. In 1948 he was appointed assistant sales manager and in the following year became sales manager on the metallurgical side. In 1950 he was made sales manager in respect of the whole of the firm's products. Mr Matthews, an incorporated accountant by profession, subsequently took up commercial work and became secretary of two separate organisations. During the war Mr Matthews was invited to take up work on cost investigation for the Ministry of Supply and continued in that work until, in February 1946, he joined British Driver-Harris Co., Ltd., to become secretary and accountant.

The Brush Group Ltd. announces that **Mr V. J. Chalwin,** the chairman and managing director of Brush Electrical (Australia) Pty., Ltd., and British Oil Engines (Australasia) Pty., Ltd., the marketing subsidiaries of the Group in Australia, has tendered his resignation with effect from 31 May last, and this has been accepted. Mr Chalwin has been with the Brush Group in various appointments for the past 11 years, during which time he has rendered outstanding service. **Mr A. P. Quarrell,** A.M.I.MECH.E., A.M.I.MAR.E., is succeeding Mr Chalwin, and has been appointed chairman of British Oil Engines (Australasia) Pty., Ltd., and managing director of Brush Electrical (Australia) Pty., Ltd. Mr Quarrell has been with the Brush Group for many years and was managing director of Associated British Oil Engines (Export) Ltd., from 1945 to 1949. He has travelled extensively for the Group on special assignments, the most recent of which was in connection with the Brush Group's business in oil producing territories. Mr Quarrell is due to arrive in Australia in August. In addition, it is announced that **Mr J. E. Cestell** becomes managing director of British Oil Engines (Australasia) Pty., Ltd.

The newly-elected president of the Illuminating Engineering Society, **Mr E. C. Lennox,** M.I.E.E., F.I.E.S., is manager of the Wear subarea, at Sunderland, of the North Eastern Electricity Board. It may be recalled that he was also president of the Association of Public Lighting Engineers in 1936-37.

Mr J. S. Ramsden (left) making the presentation to Mr Chapman

Sir Alexander Roger, K.C.I.E., chairman of the Anglo-Portuguese Telephone Co., Ltd., left England last Thursday for a business visit to Portugal and Spain.

Mr A. Deane Nesbitt has been appointed a director of British Columbia Electric Co., Ltd., and British Columbia Power Corporation Ltd. in place of **Mr A. J. Nesbitt,** who has resigned.

The Lord President of the Council has appointed **Sir Hugh Beaver,** M.INST.C.E., M.I.CHEM.E., to be chairman of the Advisory Council for Scientific and Industrial Research in succession to **Professor Sir Ian Heilbron,** D.S.O., D.SC., LL.D., F.R.I.C., F.R.S., who retires on 30 Sept. next.

The British Thomson-Houston Co., Ltd., announce the retirement of **Mr R. J. Chapman,** a departmental manager in the Industrial Sales Division of the Rugby organisation. Mr Chapman, a mechanical engineer by profession, in September, 1910, joined the staff of the B.T.H. Works Drawing Office and in 1914 was appointed head of the Pinion Department. A few years later he joined the staff of the Industrial Sales Department with special responsibilities for the application of non-metallic gears known as "Fabroil." In 1944, he was appointed manager of that Department. A gathering was recently held at the Grand Hotel, Rugby, of some dozens of friends of Mr Chapman, to bid him farewell. During the evening Mr Chapman was presented with a cheque, subscribed to by some of his many friends. The presentation was made by **Mr J. S. Ramsden,** formerly director of B.T.H. Sales, with whom Mr Chapman was associated for many years, and who visited Rugby specially for the occasion. In addition to the cheque an autograph book was given to Mr Chapman, bearing the signatures of friends.

A farewell party was given recently at the Coach and Horses, High Wycombe, to mark the occasion of the departure of **Mr Guy Fowler** from the electricity industry. Mr Fowler joined the Oxford Electric Co., Ltd., in 1931, in the Mains Department, and after two years was transferred to the Wessex Electricity Co. with whom he served until 1937, when he was transferred to High Wycombe to assist in the changeover from d.c. to a.c., an operation which occupied the best part of three years. In 1940, Mr Fowler passed into the service of the High Wycombe Corporation, who took over the undertaking in April of that year, and in 1945 was promoted to mains engineer, a position he retained when the industry was nationalised, in 1948. At the farewell party Mr Fowler was the recipient of a pair of silver tankards, suitably inscribed, presented to him by Mr Morgan, from the District Office, Reading, of the Southern Electricity Board, in addition to other gifts.

Mr F. R. Livock, T.D., B.SC.(ENG.) M.I.E.E., A.M.I.MECH.E., has been appointed sales director of Metal Industries (Electrical Division) Ltd., which includes Brookhirst Switchgear Ltd., Igranic Electric Co., Ltd., and Cantie Switches Ltd. Mr Livock joined the Metal Industries Group last October on resigning from the position of controller—education and personnel services with the General Electric Co., Ltd., which appointment he had held for about a year. Prior to the war he was in the G.E.C. sales organisation in Manchester serving there as departmental manager until the war. Demobilised in 1945 with the rank of Lieut.-Colonel, he rejoined the G.E.C. in London as staff manager. His early training experience was gained with the Metropolitan-Vickers Electrical Co., Ltd.

Mr A. E. Grimsdale, B.SC.(ENG.), special assistant sales management, Metropolitan-Vickers Electrical Co., Ltd., has been appointed a director of Metropolitan-Vickers Electrical Export Co., Ltd. Mr Grimsdale has paid many visits to overseas countries on behalf of Metropolitan-Vickers. From 1946 to 1953 he was the Company's traction sales manager, and he has recently visited Rio de Janeiro in connection with the £7 million order for electric rolling stock for the Central Railway of Brazil. He has been associated with the Company's traction business for about 25 years. From 1941 to 1945 he was assistant to the works manager at the company's Sheffield works, being concerned with the wartime production of rotating electrical machines for Service contracts. At the end of the war he became deputy sales manager of the Traction Department, being promoted to manager, traction sales, in 1946.

Sir Harold Roxbee Cox, PH.D., D.I.C., B.SC., M.I.MECH.E., F.R.AE.S., F.INST.F., Chief Scientist of the Ministry of Fuel and Power since 1948, is resigning from the public service on 30 June next, to take up an appointment as director of Wilmot-Breeden (Holdings) Ltd.

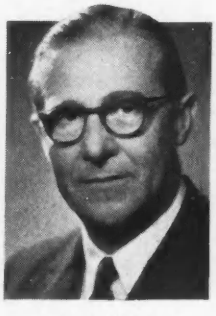
Mr John Parr-Morley, President-Elect of the Electrical Power Engineers' Association, has resigned as honorary secretary of the London Technical Group of the E.P.E.A. on account of his expected heavy commitments in Association affairs next year. Mr Parr-Morley, a construction engineer with the London Electricity Board, has held the honorary secretaryship of the London Technical Group for thirty years, and has been a principal contributor to its success. **Mr W. H. Reed** succeeds him.

Just appointed deputy sub-area engineer for No. 3 sub-area of the South Western Electricity Board is **Mr W. F. Smith,** A.M.I.E.E., who, latterly, has been district engineer at Plymouth, where he was chief technical assistant in the Corporation's electricity undertaking prior to vesting day.

The new president of the National and Local Government Officers Association, to be inducted into that office tomorrow, 18 June, is **Mr L. H. Taylor,** who is chief administrative assistant in the town clerk's department at Salford.

At a meeting of the board of the Electric Construction Co., Ltd., at Wolverhampton last Thursday, the directors appointed **Mr J. C. Milne,** M.I.E.E., M.AMER.I.E.E., to the board as technical director. Mr Milne joined the company in 1934 as rectifier engineer, successively holding appointments as chief rectifier engineer, switchgear and rectifier manager, and assistant general manager. Before joining E.C.C. he obtained early experience with the Hackbridge Transformer Co., the London Electric Railways and as development engineer with the Hewittic Electric Co., Ltd.

Mr F. R. Livock

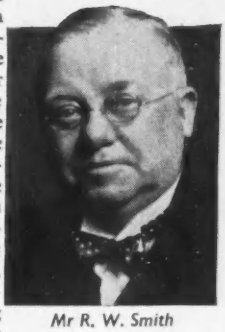


Mr A. E. Grimsdale

Mr J. C. Milne

OBITUARY

The first president of the Electrical Wholesalers Federation, **Mr R. Wilson ("Bobby") Smith,** died on 9 June, aged 82. He was to have attended a celebration luncheon at the Dorchester Hotel on 23 June and had, on the evening before his death prepared a message of good wishes to the Federation. He was born in 1872, and after completing training at Faradays in Birmingham he joined Drake and Gorham Ltd., in 1895. He became managing director of that concern in 1932, retiring from that position in July 1948, when he was presented with a silver cup by the Council of the E.W.F. at a farewell luncheon. Under his able management, the business of Drake and Gorham developed to its present eminent position in the trade. Mr R. W. Smith convened the first general meeting of whoiesalers on 9 June, 1914, eleven prospective members of the Federation attending in his office that day. He was elected chairman, and became the first president of the Federation, holding that office throughout the war period. He continued to serve on numerous committees until the late 1930's.



Mr R. W. Smith

Mr O. F. Francis, M.I.E.E., who was engineer and general manager of the Electricity Department of the Kirkcaldy Corporation from its inception in 1902 until retiring in 1938, died recently, aged 80. A native of Chester, Mr Francis studied at Liverpool University under Sir Oliver Lodge. At one time he was assistant electrical engineer to the Bootle Corporation and was afterwards with Messrs Thomas Parker Ltd., who were responsible for the laying down of the first plant for the Aldershot Town Council. He acted as resident engineer during the installation and then became borough electrical engineer there, prior to going to Kirkcaldy in 1902.

Mr Sydney Barber, a director of British Mechanical Productions Ltd., and the General Accessories Co., Ltd., died on 8 June.

Dr Alan M. Turing, O.B.E., F.R.S., Reader in Mathematics at Manchester University since 1948, died last week, aged 41. He was one of the scientists responsible for the development of the "Ace" automatic computing machine.

Mr William de Renzi, B.ENG., senior research engineer in the Electrical Department of the Expanded Metal Co., Ltd., at their Stranton Works, West Hartlepool, died on 28 May, aged 67. He was well known in the motor control gear industry and had contributed technical articles on the subject to the ELECTRICAL TIMES.

IN THE HONOURS LIST

Many Representatives of the Electrical Industry

Mr I. A. R. Stedeford (K.B.E.)

Mr Frank Rostron (M.B.E.)

ALTHOUGH probably not as lengthy as those of recent years, the Queen's Birthday Honours List published on Thursday last includes notification of awards to many engaged in the electrical and allied industries. Those to whom the honour of a Knighthood has been awarded include **Alderman P. A. Sanders,** C.B.E., J.P., D.L., who, among other things, is deputy-chairman of Davey, Paxman and Co. Ltd.; **Mr Frederick Scopes,** president of the Joint Iron Council, who is managing director of Stanton Ironworks Ltd., and a director of Stewart and Lloyds; and **Prof. F. E. Simon,** C.B.E., F.R.S., M.A., Profesor of Thermodynamics at the University of Oxford.

To **Major-General L. B. Nicholls,** chairman of Cable and Wireless Ltd., goes the honour of K.C.M.G., while **Mr I. A. R. Stedeford,** chairman and managing director of Tube Investments Ltd., who was for a time a member of the Advisory Council for Scientific and Industrial Research, becomes a K.B.E.

C.B.E.

Among those who receive the C.B.E. are **Mr T. E. Goldup,** M.I.E.E., a director of Mullard Ltd.; who is also chairman of the governors of the Ministry of Supply School of Electronics at Malvern; **Mr H. G. Herrington,** managing director of High Duty Alloys Ltd.; and **Mr V. A. Pask,** M.I.E.E., M.I.MECH.E., who has been chief engineer to the British Electricity Authority since its formation and who earlier, as personal assistant to the late Sir Johnstone Wright, was largely concerned in the general administration of the former Central Electricity Board's very extensive undertaking.

O.B.E.

In the list of recipients of the O.B.E. are the names of **Mr W. E. Cleaver,** manager, Cable and Wireless Engineering School, Porthcurno, Cornwall; Mr **E. W. Field,** managing director of H. W. Ward and Co., Ltd.; **Mr W. H. Hampton,** technical director and general manager of Chance Bros. Ltd.; **Mr F. C. Lant,** deputy chief fuel engineer, Ministry of Fuel and Power, **Mr F. H. Lister,** managing director of R. A. Lister and Co., Ltd., and a director of Blackstone and Co., Ltd., who is also employer chairman, South Gloucestershire District Advisory Committee, South Western Regional Board for Industry: **Mr J. C. Mitchell,** M.I.E.E., M.I.MECH.E., who has been controller of the North Eastern Division of the B.E.A. since February, 1948, after a long association with the North Eastern Electric Supply Co., and **Mr F. M. Colebrook,** senior principal scientific officer, National Physical Laboratory, D.S.I.R..

M.B.E.

Individuals who receive the M.B.E. include **Mr. C. E. Addis,** B.E.M., assistant works manager of Bulpitt and Sons Ltd.; **Mr D. L. Brownlow,** director and chief engineer to Mirrlees, Bickerton and Day Ltd. **Mr F. N. Calver,** engineer-in-charge, Daventry transmitting station of the B.B.C.; **Mr R. H. J. Cary,** A.M.I.E.E., senior experimental officer, Radar Research Establishment, Ministry of Supply, Malvern, **Mr W. T. Gann,** M.I.E.E., for his services as district manager at Southport to the Merseyside and North Wales Electricity Board (earlier he had been borough electrical engineer and manager there); **Mr C. E. Lee-Jones,** district engineer, Derby district, Derby and Burton sub-area of the East Midlands Electricity Board; **Mr S. H. Lines,** general works manager of A. C. Cossor Ltd.; **Mr Frank Rostron,** export sales manager to Ferranti Ltd., who has been prominently associated with that company's activities in the American and Canadian markets; **Mr J. H. Saunders,** assistant electrical manager to Harland and Wolff Ltd., Belfast; **Mr G. S. Scott,** manager, Naval Test Department, Evershed and Vignoles Ltd.; **Mr A. I. F. Simpson,** senior engineer with the General Electric Co., Ltd., at Allesley, Coventry; **Mr L. F. Smith,** company secretary to the Longford Engineering Co., Ltd., refrigerator manufacturers, and **Mr G. W. Wilson,** sales director of the Belmos Co., Ltd.

B.E.M.

Among the lengthy list of recipients of the B.E.M. are **Mr H. R. Batchelor,** foreman, Submarine Cables Ltd.; **Mr T. Dick,** foreman, Victor Products Ltd.; **Mr J. E. Evans,** shift charge engineer at Dolgarrog hydro-electric station, Merseyside and North Wales Division, B.E.A.; **Mr J. Grieve,** leading linesman, South West Scotland Electricity Board, Johnstone; **Mr A. Hawkesworth,** mains foreman at Romford, London Electricity Board; **Mr R. G. Howard,** fields research engineer, Davey, Paxman and Co., Ltd.; **Mr W. Pemberton,** jointer at Oldham, North Western Electricity Board; **Mr H. Scaife,** installation inspector at Scarborough, North Eastern Electricity Board; **Mr Cyril Walker,** foreman electrician, Cabot Carbon Ltd.; **Mr E. J. Winkworth,** leading turbine driver at Reading, Southern Division of the B.E.A., **Mr A. Wright,** leading stoker at Stoke power station, Midlands Division, B.E.A.; **Mr P. O'Kane,** foreman with Isco Ltd., **Mr P. H. Jones,** mechanic examiner, Inspector of Electrical and Mechanical Equipment, Ministry of Supply, Deptford; **Mr George Hill,** foreman with Bray Accessories Ltd., and **Mr W. J. B. Chapple,** carpenter and joiner at Cambridge, Eastern Electricity Board.

Of the overseas awards, we have only one to note, that of **Mr E. A. Sackey,** A.M.I.E.E., the deputy chief electrical engineer at Accra on the Gold Coast, who receives the O.B.E.

Mr V. A. Pask (C.B.E).

Mr J. C. Mitchell (O.B.E.)

Mr T. E. Goldup (C.B.E.)

Mr S. H. Lines (M.B.E.)

Mr G. W. Wilson (M.B.E.)

PROBLEMS AND PRACTICE

In Engineering

Gas Pipe Earthing

THE circumstances described by Mr Wedlake make most disconcerting reading as we must all agree with him that similar conditions are likely to exist in many buildings. I think the first test to apply when these conditions are suspected is to check the ohmic resistance between the water and gas pipes. If this is zero or practically zero then it would seem that the pipes are in physical contact or in contact with a metal object which is electrically bonding them together.

Efforts could then be made to separate the pipes from the common bond. If such separation could not be effected then I think it would be best to install an earthplate, taking the earthing leads to this plate instead of to the water pipe. Alternatively, permission could be sought from the Supply Authority to allow the earthing leads to be connected to the lead sheath of the supply cable, explaining the circumstances which were existing.

My own opinion with regard to the suggestion of bonding the gas and water pipes together to prevent any spark jumping between them is that it would be a dangerous thing to do in some circumstances.—*R. A.*

WITH regard to the problem sent in by Mr W. T. Wedlake under the above title, I have had a long and varied experience of happenings of this nature but this particular case is of peculiar interest in that the installation was new, and so far as the test could determine, was effectively earthed. Yet, if that were the case, how could a fault current attain a sufficient potential to cause the flow of a destructive current between the gas pipe and the steel joist on which it was resting.

I am of the opinion that, beyond the range of the test made, the continuity of the legitimate earth route between the premises and the supply point left much to be desired. In consequence, the fault current took the lower resistance path to earth offered by the gas system. In every one of the many cases I have examined I found the earthing arrangements either non existent or deteriorated.

It was once believed that the remedy lay in the replacement of the usually used compo pipe by iron tubes and a deal of money was spent to make the change, but it was found that iron pipes were no less vulnerable. I carried out a number of experiments to examine this conclusion and found that this was undoubtedly the case.

In about 1926/7 (my records have been destroyed by enemy action) these risks were examined at Institutional level and, under the auspices of the Institution of Electrical Engineers and the National Gas Council a meeting was held in London between representatives of the two industries. I was present at that meeting and so far as my recollection serves me, after a long discussion three essential recommendations were reached namely:

1. That there was a need for close technical co-operation between the officials of the Electrical and Gas Undertakings in connection with every case.
2. That adequate and maintained spacing should be insisted upon between cables and gas pipes.
3. That earthing provisions should be examined periodically.

To the best of my knowledge, these recommendations have been conscientiously implemented and both parties regard themselves as joint trustees for the safety of their consumers. The gifted amateur who lashes a cable firmly to a gas pipe will, like the poor, be always with us. He is responsible for many serious happenings. Moreover, the growing use of concrete pipes by water suppliers has to be kept in mind when planning earthing provision.

The use of ferro-concrete in the construction of modern buildings is helpful as there is less risk of metallic connection between cable sheathings and gas pipes by contact with naked steel sections. On a new building adequate precautions can be taken against the risk of fusion but in the case of an old building it is almost impossible, short of exposing the whole of the cable and gas routes, to guard against that risk. It is no uncommon thing to find cables and gas pipes lying snugly cheek by jowl in the same notch cut in the floor joists.

It has often been suggested that gas pipes and cable sheaths should be made common by the use of multiple cross bonding and that an insulated joint should be installed on the inlet to the gas meter but this is, and always may be, a very debatable point. What is certain is that, today, the nature of the fusion risk is well understood by both electricity and gas suppliers.

I have one, and only one, case in mind which was somewhat similar to that quoted by Mr Wedlake. In that case the connection between a fault charged conduit and a gas pipe was established by a number of iron saucepans, crowded together under the counter of a second-hand shop.—*H. C. Widlake.*

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Non-earthed Appliances

I WAS asked to investigate a fire which had broken out in a private house. It was brought about by the vacuum cleaner, in which the supply had broken down to the metal case. As the machine was unearthed, the fault had not shown itself, moreover, as it was being used on a heavy piled carpet on a wooden floor, no shocks were received from it.

One day the housewife touched the lead gas pipe with the cleaner. This gas pipe was supplying a gas fire in the sitting room. There was a flash, and a hole was blown in the pipe, setting fire to the gas.

Fortunately, someone was present and turned the gas off at the main, reducing the damage to a minimum, but the experience points to the need for such appliances to be earthed.—*B. H. Bullick.*

Faulty Earthing

AN electrician (in charge of a works supplied from the secondary side of a 250 kVA delta/star, 11,000/415/240 V transformer) reported that he had received an electric shock on contacting the neutral conductor. The trouble had persisted for about a week before clearing itself. The transformer neutral was connected to an earth electrode and the consumer's non current-carrying metal work was assumed to be directly connected to this neutral. As well as being bonded to the metallic sheath of the incoming underground cable, the transformer tank was also connected to an independent earth electrode. Core balance earth leakage protection, set to operate at 15% of full load current, was provided on the work's metal-clad switchgear.

An investigation showed that the consumer's non current-carrying metal work was not directly connected to the transformer neutral but to the transformer tank or, in other words, to the h.v. earthing system. Resistance to earth tests of the two earth electrodes gave the following results; h.v. 0·1 ohm, transformer neutral 16·0 ohms.

Three or four weeks of dry weather had preceded these tests. It will be apparent that if one phase of the m.v. side had gone completely down to earth the maximum current flowing through the earth circuit could not have exceeded 15 amps. A fuse rated at more than about 5 amps might possibly not have blown and therefore might have created a dangerous situation. As the h.v. earthing system had so low a resistance to earth, the transformer neutral was also bonded directly to it.—*E. A. Robbins.*

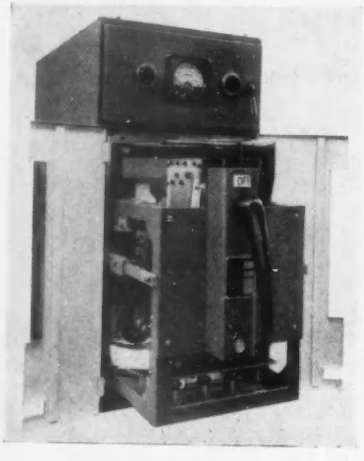
Equipment for Industry

Air-break C.B.'s for L.V. Systems

FOR industrial and power station l.v. supplies up to 660 V, J. G. STATTER AND CO., LTD., 82 Victoria St, S.W.1, have recently introduced a range of high rupturing capacity air-break circuit-breakers which have been A.S.T.A. tested and proved for a rupturing capacity rating of 26 MVA at 415 V, in accordance with B.S.116:1952. Successful make and break tests have also been made at 31 MVA at this voltage.

Manufactured in all standard current ratings up to and including 2,000 A, the breakers are available in three types of mounting—open type front of panel mounting, front of panel operation; back of panel mounting, front of panel operation; and horizontal draw-out type for cubicle mounting. Units can be fitted with the usual automatic features, which include time lag, overload, undervoltage release, and shunt trip. They are also available with d.c. solenoid closing. Manually operated breakers are provided with a rotary lever type operating handle, whilst the horizontal drawout type may be isolated without opening the front access doors.

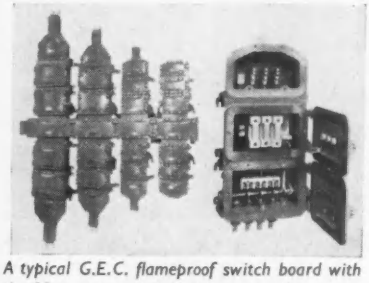
This example of Statter's air-break circuit-breakers is the horizontal draw-out type which is the version designed for cubicle mounting



FLP Switchgear by G.E.C.

A NEW range of flameproof switchgear has been recently developed by the GENERAL ELECTRIC CO., LTD., Magnet Hse, Kingsway, W.C.2, for use in collieries, oil refineries and other hazardous areas. Certified FLP for Groups 1, 2 and 3 (as defined in B.S.229:1946), the equipment is designed for building two- and three-phase, four wire m.v. distribution switch and fuse boards for currents up to 100 A at 660 V. Individual units may also be used alone if desired. Included in the range are d.p. and t.p. (with neutral) switches, fuse and busbar chambers, terminal boxes, conduit adaptors, cable sealing boxes and cable box reserve entry chambers together with accessories. Units are fully interchangeable. Fuse chambers may be fitted with holders for either h.r.c. or rewireable fuses.

To make provision for mounting either above or below the busbar chambers, two forms of sw/fuse are available, the fuses being above or below the switch chamber. In compliance with B.S.229, fuses and switch are mounted in separate flameproof chambers, each of which has its separate cover. A mechanical interlock prevents access to the fuse chamber whilst the switch is closed. The terminal box fitted to each sw/fuse unit forms a third self-contained enclosure, whilst terminal boxes for the open end of the switch chamber are also available for units mounted separately. In the d.p. form, switch fuses are available in 15, 30 and 60A ratings and in the t.p. form, this range extends to 100 A.



A typical G.E.C. flameproof switch board with the 30 A, t.p. switch fuse for mounting above the busbars

Seven types of busbar chamber are available for the different combinations of current rating and number of poles. Each chamber has four 300 A busbars. One end is open and the other closed, busbars taken through the latter by means of flameproof bushings to enable chambers to be bolted together end to end.

New "Tubela" Equipment

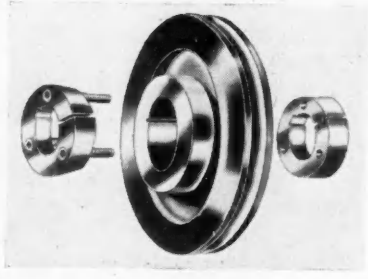
AUGMENTING the "Tubela" range of conduit bending and working machines for electrical installation work are two recent introductions of hydraulic bender stands and a pipe screwing bench. Obtainable from the TUBELA ENGINEERING CO., LTD., Furze St, Bow, E.3, the bender stands are designed to raise the height of the bender to allow maximum clearance below the winghead for making double sets without restriction. Fabricated in steel tubing, the stands are supplied with flanged feet for site work or with castors fitted to the two front feet to facilitate workshop handling. Two models are available whilst each may be supplied with a detachable metal tray.

The pipe screwing bench is fabricated in steel tubing with "Kerung" timber top and "H" frame roller assembly. Having a high strength to weight ratio, it is fitted with a specially shaped bracing for carrying on the shoulder. Its maximum width of 24 in. allows considerable clearance through doorways, whilst it is 36 in. high and 42 in. long, and weighs 55 lb, less pipe vice.

"Dualok" Taper Locking Pulley

AN unusual form of pulley mounting is seen in the new "Dualok" twin-grip, taper locking system manufactured by the ZERNY ENGINEERING CO., LTD., Oppidans Mews, N.W.3. It features twin tapered bushes as the means for fitting the pulley. Each bush is split, so that as they are drawn together by means of three screws, into the hub of the pulley, they grip both shaft and hub with a wedging action. The torque required to move the smallest "Dualok" hub, fitted without a keyway, is claimed to be as high as 400 lb ft, equivalent to a transmission of 75 h.p. at 1,000 r.p.m.

Stated to cost little more than an ordinary keyed-on pulley, the "Dualok" is available with interchangeable bushes for all standard sizes, from $\frac{1}{2}$ in. to 4 in. diameter shaft, and up to 42 in. p.c.d. with $\frac{3}{8}$ in. grooves. No keyway is necessary, and the pulley may be fitted or removed rapidly by unskilled labour. It is neat in appearance, the bushes fitting flush on each side of the pulley. The same method may also be employed for chain wheels, gear wheels, flat pulleys or special applications.



The new "Dualok" taper locking pulley

Marking Electrical Parts Direct

FOR the direct marking and printing of scales, labels and general work of this nature, REJAFIX LTD., 821 Fulham High St, S.W.6, supply a basic range of machines, each of which may be adapted to the particular needs of the component or unit to be marked. They are combined printing and marking machines, designed for installing in the production line at any desired point. Hand operated, semi or fully automatic machines are available, suitable for marking plastics, glass, wood, metal, rubber and porcelain. Special marking and printing inks have been developed according to the properties required.

Hotpoint Rotary Ironer

SOME design changes to their RL Rotary Ironer have been announced by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., Fletton, Peterborough.

To be known as Model RL/B, the Rotary Ironer incorporates a very much improved cable arrangemen.. The service cable terminates in a redesigned shoe support bracket, and protected glass insulated leads are taken into the thermostat control cover.

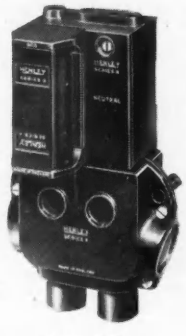
The ironer shoe back cover is finished in black and the shoe temperature is increased to give a better finish to fabrics which require a higher controlled ironing temperature.

Henley's Series 4 Service Fuses

RECENTLY marketed by W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., 51-53 Hatton Garden, E.C.1, their new range of Insulated Service fuses, the Series 4, has been designed for currents up to 60 A to provide maximum flexibility in the possible arrangements for double pole fuses with and without sealing chambers. It comprises an s.p. model, a d.p. model and separate sealing chambers.

Special features of the new series are (*a*) a mounted turret fitted to the base precluding the possibility of accidental contact with live terminals, (*b*) easy renewal of cartridge fuse links, (*c*) protected cable entries and (*d*) a spigot for interlocking the double pole service fuse base and the cable sealing chamber.

The moulded turret mentioned is fitted to the fuse base and prevents accidental contact when the fuse carrier is removed. It completely shields the cable terminals and is provided with slots to receive the contact blades of the carrier. It is secured to the base by a captive fixing screw, holes being provided to enable the carrier to be sealed to the turret.



Series 4 fuse

Two sealing chambers are available for use with the d.p. model, one has a single vertical entry and the other two vertical and two horizontal. Busbars are available for connecting two or more single pole fuses or one or more s.p. fuses to a d.p. fuse.

G.E.C.'s 6 V Mobile Amplifier

MODEL B.C.2 2406 is a new inexpensive mobile amplifier introduced by THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. It is a convenient unit for use in a vehicle for p.a. work and operates from a 6 V battery with low power consumption.

The equipment is designed for use with a high impedance moving coil or close speaking crystal microphone and will operate one or two loudspeakers which may be either exponential horn or re-entrant types. Operation is simple since only three controls are provided, a battery on/off switch, a microphone on/off switch and a volume control.

Frequency response has been specially arranged to give maximum speech intelligibility when used with pressure horn speakers and is −6db at 120 c/s and −6db at 8 kc/s referred to the level at 1,000 kc/s.

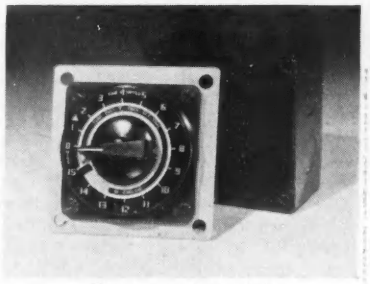
Weighing 10 lb and measuring 11 in. by 8½ in. by 5 in., the amplifier costs £22. 15s. including twin battery leads, a high impedance moving coil microphone and connecting cable.

Time Switches by Smiths

DEVELOPED from the popular Pinger Minute Timer, a new timing switch produced by SMITHS ENGLISH CLOCKS LTD., Sectric House, Waterloo Rd, Cricklewood, N.W.2, has met with great success in the export market.

The flush or panel mounting model 0-15 minutes is being fitted by a continental washing machine maker.

The movement is mechanically operated and has a trickle escapement similar



The new timing switch

to the Timer, the setting being accurate to within plus or minus 5%. It is housed in a plastic moulded case and is fitted with a single pole switch with a rating up to 15 amp. Contacts are of silver fused into phosphor bronze strip. Contact pressure is 150 grammes. The standard switch is for a.c. mains only. It has a black anodic dial with adjustable limit stop enabling the time material to be accurately repeated. The Timer can be supplied either for flush panel mounting or complete with metal top plate suitable for fitting into a standard metal box. Ranges of either 0-15 minutes or 0-55 minutes are available. Price is 34s.

Coldrator Service Cabinets

TWO new service cabinets have been announced by INTERNATIONAL REFRIGERATOR CO., LTD., Fletton, Peterborough. They are the D.S 130, a single door cabinet of 12·1 net cubic foot capacity, built from sheet steel and finished in white stove enamel, and the D.S. 180 of 17·4 net cubic foot capacity.

External dimensions of the B.S. 130 are height 66¾ in., depth 28½ in. and width 32¾ in. The many special features include a spacious across the top freezer,

For the Electrical Trade

complete with plastic doors providing 1·49 cu ft of low temperature storage and 80 ice cubes per freezing in four trays; a plastic drip tray; three rigid steel wire shelves; door-operated light and locking latch. List price is £145.

Model D.S. 180, however, is a double door unit 42 in. wide. Its freezer is slightly smaller and ice cube capacity halved. However, storage shelf space is half as much again as the D.S. 130 at 20 sq ft.

Both units have hermetically-sealed units with automatic cold control with "off" position and Five Year Plan guarantees.

TRADE PUBLICATIONS

PROTECTIVE GEAR.—Revised publications issued by A. REYROLLE AND CO., LTD., Hebburn, Co. Durham, are pamphlets 1236—Class G.P. cartridge fuse-links and 1264—Solkor B. feeder protection.

ACCESSORIES.—Two new publications by NETTLE ACCESSORIES LTD., Harper Rd, Wythenshawe, Manchester, are concerned with inexpensive architectural fittings for wall or ceiling mounting and the complete range of weatherproof and watertight couplers, plugs, sockets and striplights.

TELECOMUNICATIONS.—A reprint from the *Financial Times* of the article "The Growth of Telecommanications in Britain" has been issued by AUTOMATIC TELEPHONE AND ELECTRIC CO., LTD., Strowger Works, Liverpool, 7.

CABLES.—Ediswan Rubber Cables are listed in a new catalogue issued by the EDISON SWAN ELECTRIC CO., LTD., 155 Charing Cross Rd, W.C.2.

TRANSFORMERS ETC.—The NELSON ENGINEERING CO., LTD., Netherfield Rd, Nelson, Lancs, have issued a general range of literature covering their transformer and motor products and electrical services.

MOTORS.—Variable speed a.c. commutator motors for use in colleges are the subject of new pamphlet by A. REYROLLE AND CO., LTD., Hebburn, Co. Durham.

NEWS OF THE WEEK

Electricity wanted on Scottish Border

S.E. Scotland Consultative Council to meet B.E.A.

A DEPUTATION from the S.E. Scotland Electricity Consultative Council is to meet representatives of the B.E.A. at the end of this month to discuss the question of rural supplies to the Border areas. We understand that Sir Henry Self will meet the delegation which will comprise the Council's chairman, Mr J. M. Airlie, his deputy and two others. The party's main plea is for a special capital allocation for the North Northumberland district, but their appeal goes a little deeper than that. The Council has been concerned about rural development for some little while and in March asserted that the S.E. Scotland Board's allocation of £167,000 was totally inadequate (see our 11 Mar. issue). Dissatisfied with that amount the Council decided to approach the B.E.A. direct. It was stated at the time that the £167,000 capital allocation would provide for only two of nine development schemes, probably excluding the Border area in the part of Northumberland served by the S.E. Scotland Board. That area seemed unlikely to be connected for several years, whereas in the rest of the county outlying farms were being connected by the N.E. Board within a year. Fear was expressed that as a result they might lose the area to the English Board with consequent loss of income.

At last week's meeting of the Council it was reported that £1¼ millions had been spent on rural electrification since 1948, and 2,615 of a total of 6,062 potential farm consumers had been connected. In the southern sub-area (of particular interest) 574 of the 1,900 farms had received supplies. For the year 1954-55 it was proposed to spend an additional £337,000, of which £167,000 would be devoted to the southern sub-area.

This same Consultative Council was recently successful in obtaining prompt action for supplies to rural schools (see our 15 Apr. issue). It will be recalled that they asked that such schools, threatened with extinction because they lacked amenities and staff could not be found to take appointments, should be given priority.

10,000 Water Heaters

AS a result of their intensive campaign to promote the sale and hire of electric water heaters, the Merseyside and N. Wales Electricity Board have now installed over 10,000 heaters, and sales continue at a most satisfactory level. The 10,000th heater was fitted in a Liverpool home last week and to mark the occasion, the new owners were presented with an electric kettle on behalf of the Board by sub-area manager, Mr P. Bregazzi.

Birmingham Engineering Centre opens Today

THE fruits of many months of hard work are on show today at the Birmingham Exchange in Stephenson Place, where a permanent exhibition of British goods was opened by Lord Bennett of Edgbaston. If all the ambitions for this Engineering Centre are achieved it should be a most useful asset, not only for visiting overseas buyers but also for manufacturers and buyers in this country. Main function of the Centre is to provide manufacturers with facilities, all the year round, for displaying their products, and at the outset of the venture some 200 exhibitors had taken space, including over 40 firms with electrical interests. Display space is available at charges varying from £35 a year for a small wall panel to a maximum of £450 for a large island stand. The contract, for one year with the option of renewal, includes uniform shell structures of various sizes. With the export market particularly in mind every encouragement is being given to foreign trade representatives, consuls and the overseas Press to visit the Centre.

Although the electrical exhibition of products is probably most important, numerous other facilities are being afforded. Special attention is being given to the library containing catalogues of over 5,000 engineering firms as well as directories and reference books. In addition there is a small hall for private, short-term exhibitions, lecture rooms for trade and technical association meetings, private offices with telephone and secretarial facilities, a coffee room including copies of current technical publications, and a stand design service.

Among exhibitors who are in, or closely connected with, the electrical industry are: Barlow Whitney Ltd.; Bill Switchgear Ltd.; Brentford Transformers Ltd.; British Rototherm Co., Ltd.; Brooke Tool Manufacturing Co., Ltd.; Chrisby and Norris Ltd.; Clifford Aero and Auto Co., Ltd.; Copper Development Assoc.; A. C. Cossor Ltd.; Dewrance and Co., Ltd.; Dictograph Telephones Ltd.; Donovan Electrical Co., Ltd.; Electro Dynamic Construction Co., Ltd.; Foster Instrument Co., Ltd.; Wm. Geipel Ltd.; General Signal and Time Systems Ltd.; Guest, Keen and Nettlefolds Ltd.; Hackbridge and Hewittic Electric Co., Ltd.; John Harris Tools Ltd.; Hilmor Ltd.; Hopkinsons Ltd.; Horstmann Gear Co., Ltd.; Ioco Ltd.; Kelvin and Hughes Ltd.; Lancashire Dynamo Group; Lansing Bagnall Ltd.; McKechnie Bros. Ltd.; Magnesium Electron Ltd.; Murex Welding Processes Ltd.; Nelco Ltd.; Ottermill Switchgear Ltd.; Power House Components Ltd.; R. B. Pullin and Co., Ltd.; Rowe Bros. and Co., Ltd.; Joseph Sankey and Sons Ltd.; Santon Ltd.; Siemens Electric Lamps and Supplies Ltd.; Simplex Electric Ltd.; Herman Smith (Smithlite) Ltd.; Tenaplas (Sales) Ltd.; Herbert Terry and Co., Ltd.; Worthington Simpson Ltd.; and Wright Electric Motors Ltd.

Thirty-two Nations invited to attend American Instrument Congress

AN INVITATION to attend the first International Instrument Congress and Exposition at Philadelphia next September was extended to scientists and engineers of 32 foreign countries at a special luncheon given by the Instrument Society of America's President, William A. Wildhack, in Washington.

Representatives from the foreign embassies and the U.S. Government were given an outline of the plans made to date, and were told that consolidated exhibits had been arranged by England, France, Germany, Japan, Sweden and Switzerland. Special invitations have been prepared for distribution to foreign countries through their Embassies.

Anglo-U.S. TV Tie-up

COLOUR television cathode-ray tubes are to be made in England under an agreement signed between Thorn Electrical Industries Ltd. and Sylvania Electric Products Inc. The new company, Sylvania-Thorn Colour Laboratories Ltd., owned on a fifty-fifty basis, will begin work at once in premises on the outskirts of London.

Industry and the Call-up

JUNE issue of the BACIE Journal contains a comprehensive report on the conference on Industry and National Service, held last Mar. The conference was held jointly by the War Office, the R.A.F. and the British Association for Commercial and Industrial Education. Apart from the above there were about 45 industrialists present.

Underground Railway for Glasgow too Costly

ALTHOUGH it is fully agreed that the best way of solving Glasgow's heavy transport problem would be to construct an underground railway system similar to London's, the idea has been ruled out on the grounds of excessive cost. This is the conclusion reached by the London consultants, Sir William Halcrow and Partners, in their preliminary report on Glasgow's transport difficulties submitted to the Transport Committee last week. The consultants estimated that to build a system like London's it would cost about £4 millions per route mile. The only other scheme likely to prove as efficient would be the electrification of some of the existing steam-operated railways if that was feasible and economically possible.

The Committee was to continue consideration of the report for two weeks, but it is expected that the recommendation to abandon the idea of extending and enlarging the present underground railway will probably be accepted, and that a full report with definite recommendations will not be sought. The Corporation will almost certainly be wary of accepting such heavy financial responsibilities on tentative proposals, unless the British Transport Commission and the corporation became the transport authority for the whole area and received Government financial backing. The alternative of electrifying steam-operated railways will be considered separately.

In the consultants' report it is pointed out that the existing underground system, the track gauge was not standard on British railways, tunnels were only 11 ft in diameter, platforms could only accommodate two cars, and steep gradients would involve extra and heavy cost. A proposal for new underground lines to serve some larger outlying estates is also contained in the report.

From Armaments to One Million Electric Motors

A NOTABLE milestone was passed at the Newcastle-under-Lyme works of the British Thomson-Houston Co., Ltd., recently, when the millionth f.h.p. motor to be made there came off the production line. The event is significant in that during the war the factory was producing arms and the changeover to electric motor manufacture was put in hand in 1945. Plans were that the Newcastle-under-Lyme factory should share the load with the established works at Coventry. Readers will probably recall that the Coventry works celebrated the production of its 3 millionth motor in Mar. 1951.

At Newcastle the first part of the company's plan was to get pilot plant installed and working, and workers trained. This was completed in 1946. The second stage was to lay down three production units to deal with quantity production of the various types of motors, and these were in operation by 1948. Shift working was introduced a year later. A further scheme of expansion was embarked upon in 1951. It so happens that the million mark has been passed at the time when a fourth and most modern production unit has been completed which will add another 30% to the company's output capacity.

Belfast Cable Order

A CONTRACT for the supply and installation of about seven miles of cable has been awarded to W. T. Henley's Telegraph Works Co. by the City of Belfast. We understand the order involves 0·3 sq in. three-core 110 kV oil-filled cable, together with auxiliary cables and accessories. The installation will link the power station West with the N. Ireland Electricity Board's Donegal substation.

Electrical Plant for Steel Mills

A SUBSTANTIAL order for driving equipment and electric motors for three new steel rolling mills at the Lackenby works of Dorman Long and Co., Ltd., has been received by Metropolitan-Vickers Electrical Co., Ltd. The order is said to be worth over £750,000. Equipment is required for a 40 in. roughing mill, a 53 in. universal beam roughing mill and a 53 in. universal beam finishing mill. Each will have a double armature main motor of 24,000 h.p. peak as a main drive, and in addition the beam roughing and finishing mills will have a supplementary stand powered by a twin-drive of 8,100 h.p. peak. It is hoped that the mills will be operating and producing universal beams in 15 months. Metrovick and their associates, the British-Thomson-Houston Co., Ltd., will be collaborating closely to keep to that programme. They will share both in design and manufacture of the equipment which will be built at their works at Trafford Park and Rugby.

This order represents part of Dorman Long's postwar development programme for its iron and steel works. Cost of this stage is estimated at £36 millions.

Lowestoft's Heavy Bill for Cooker Repairs

MISUSE of electric cookers and the heavy cost of maintenance is causing some concern among Lowestoft town councillors. It has been decided that in future the housing manager will give a monthly report on the position. Last September the Council was told that 514 of post-war houses were provided with electric cookers and 581 with gas appliances. In the first half of last year 277 repairs had been carried out on electric cookers as compared with 22 on gas cookers. Last week a similar report was submitted in respect of the seven months up to March, during which time 379 repairs were made. Cause of the trouble is attributed to misuse of the appliances, because of 470 houses visited by demonstrators of the Electricity Board, in 328 cases incorrect utensils were being used, and 293 were without electric kettles. As a result failures occurred mostly in hot plates, which were being used for boiling water.

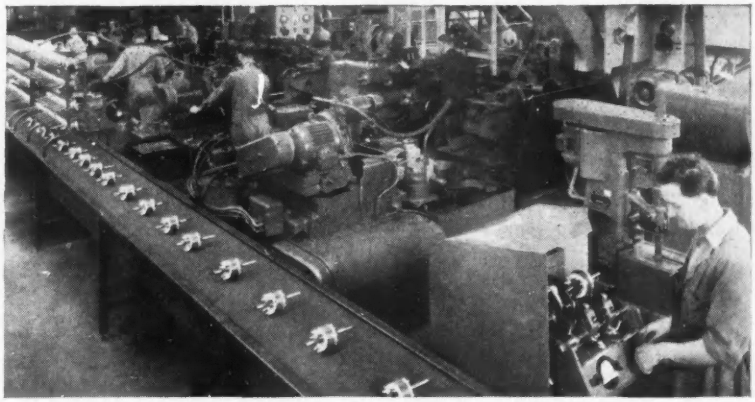
OFFICIAL PUBLICATIONS

BOILER EXPLOSION. Report of preliminary inquiry into explosion from water tube boiler at Barton power station last August. H.M.S.O. 6d.

BRITISH STANDARDS. B.S.1523, 1954: Glossary of Terms used in Automatic Controlling and Regulating Systems. Section 3, Kinetic Control; and Section 5, Components of Servo-mechanisms.

LAWS ON POLLUTION

THE majority, if not all, the legal provisions affecting the disposal of trade effluent has been assembled into one handbook entitled *Disposal of Waste Waters from Industrial Premises.* The booklet has been compiled by the F.B.I., of 21 Tothill St, S.W.1, at 2s. 6d. each, and is obtainable from the Federation. The handbook gives an idea of the difficulties facing industry in performing its tasks without damaging fisheries and amenities. It also describes some of the research work which is being carried out on the technical aspects of the problem.



Well on the way towards the 1,000,000th electric motor. In this photograph is the rotor conveyor showing the grinding and balancing machine at B.T.H's. Newcastle (Staffs) factory

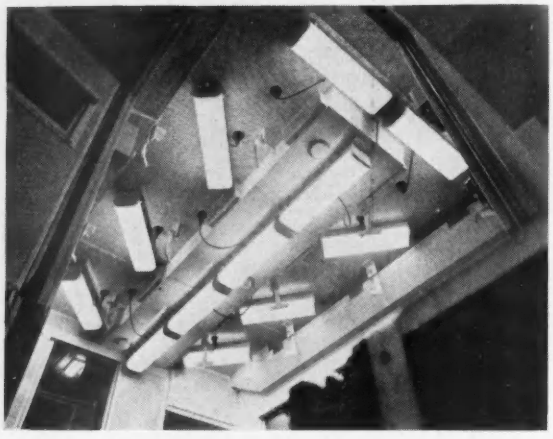
Portable Lamps still needed in Mines

REPORT of the Mine Lighting sub-committee to the National Illumination Committee was read at the annual meeting of the Mining Institute of Glasgow. Main conclusion was that despite advances in mains lighting in coal mines, efficient lighting by portable lamps was needed as much as ever. Mains lighting systems at the coal face had been carried out as controlled experiments, but had nevertheless increased. Even if mains installations became numerous, they would have to be augmented by portable lamps for emergency uses, the report stated. Among the sub-committee's findings was that the need for adequate training of lampmen and their assistants remained. Encouragement of the work of the Miners' Electric Lamp Consultative Committee was recommended. In general, the sub-committee felt there had been a material improvement in the general standard of portable lighting since 1947, but there was still some disparity between installations.

Salesmen warned against Difficulties of the Future

A WARNING of what was in store for British industry and its salesmen in particular when the pound was freed, was given by Mr R. A. Twomey at the Incorporated Sales Managers' Association's recent annual conference. Although our factories were not behind those of the U.S.A., controls had caused our salesmanship to fall seriously behind, he said. Everyone present had been feather-bedded by currency regulations, said Mr Twomey, who maintained that despite popular belief, salesmen had not been working in genuinely competitive conditions in the past few months. At no time since before the war would salesmen have to fight for business than when the pound sterling was set free; and when the last pound of inflationary money had been spent and every manufacturer was free to make and sell whatever he chose, to whom he chose, and in whatever quantities he chose, Mr Twomey added.

Another speaker at the conference was Col J. R. Harper, of Bristol Cellophane Ltd., who spoke of his experiences in overseas markets. Among countries he has visited recently were Africa, Pakistan, India and Ceylon. South Africa was a buyers' market, he said, where the order collecting type of salesman was useless. The person needed there was the bull-dog type of salesman. The standard of living was high and two motor cars and a refrigerator were perfectly normal. In E. Africa there was the opportunity for a large volume market for manufacturers able to produce large volume at low price. Col Harper said Japan was beating us to it in West Pakistan, particularly in the field of machinery. A similar problem existed in India, which was probably the largest potential market in the world. Ceylon also presented scope for development, but few U.K. executives appeared to visit that country. He went on to say that in order to be successful exporters, we must build up volume in the home market. He particularly mentioned Canada's attention to building up trade through hire purchase methods, and their gentle fostering of the attitude of "keeping up with the Jones's."



The twelve batten type fittings installed above the computing equipment in new Sabre Jet flight simulators being made in this country for the R.C.A.F. Fittings were supplied by Philips Electrical Ltd.

Special Lighting Scheme for Flight Simulators

A LIGHTING application which departs from the usual run of installations is the system fitted in the Sabre Jet flight simulators to be used in the training of pilots by the Royal Canadian Air Force. Most of the simulators are of the mobile type, housed in 36 ft-long trailers. Requirements included a dependable system providing good illumination, and because of limited space and the need to restrict weight, the installation had to be of simple design and involving the minimum of special gear.

Philips Electrical Ltd. were entrusted with the task, and it was finally decided to employ a circuit using the basic components of the MCFD/U circuit, specially designed by the company for transport lighting applications. Twelve batten-type fittings, each with two 2 ft 20 W fluorescent lamps were mounted in the part of the trailer housing the computors. Positioning had to be carefully considered in relation to the large amount of electronic equipment involved in the simulators. In the instructor's section of the trailer a further two fittings were installed. All the special fittings mentioned have reeded Perspex covers.

The flight simulators are being made by Redifon Ltd., London, and the trailers, of metal-framed construction by Park Royal Vehicles Ltd.

AREA GOLF FINALS

ANOTHER of the dates of the Area Golf Finals preparatory to the E.I.B.A.'s National Championships later in the year has been fixed. The E. Midlands have arranged to play off their eliminating games at the Rushcliff Golf course, East Leake, Nottingham, on 14 July. Details of the meeting may be obtained from the area's hon. secretary, Mr P. M. Furse, of Furse Wholesale Ltd., Traffic St, Nottingham.

Area finals in the south-east are to be held at the Royal Eastbourne Golf Club on 9 July. A visitors' open competition will take place during the afternoon and proceedings will end with a dinner. Area secretary is Mr R. E. Prickett, 59a Middle St, Brighton.

ELECTRICIANS' STRIKE AT CADBY HALL EXTENDED

SHOP-STEWARDS of the Electrical Trades Union have this week extended the strike of maintenance electricians at the Cadby Hall and Greenford factories of J. Lyons and Co., Ltd., to all that firm's establishments in London. At a meeting of the electricians on Monday, shop stewards explained that the new "all out" policy was an official union instruction which must be obeyed, it is reported. An additional 230 E.T.U. members were called out this week, bringing the number on strike to 430. The strike began about five weeks ago. We earlier reported that many of the electricians had voted against an extension of the strike.

The First Half-Century

To come to the practical problem, which is to get an intelligible telephone message through a submarine cable and over a longer land-line than is now possible, or to the simpler working case of increasing the speed of sending over long sections of ocean cable, hitherto the popular remedy has been to diminish the capacity effect by the introduction of leaks in the cable. In this way it is possible to get rid of the "distortion" to some extent, but, as Professor Fleming pointed out, "it spoils the wave." Wherefore he would appear to prefer Professor Pupin's method, which is to introduce distributed inductance. Putting the thing into figures, to find the amount required, this does not seem feasible in a submarine cable at all, but Professor Pupin has shown that something sufficiently near to it to produce a practical improvement can be done on long telephone circuits.—*From our issue of* 16 *June*, 1904.

Manchester E.I.B.A. Branch to be reconstructed

AT the recent annual meeting of the Manchester and District Branch of E.I.B.A. it was agreed that the Branch should be reconstructed on a broader basis. An advisory committee representative of all sections of the industry was elected. Officers elected at the same time were Mr H. Cobden Turner, chairman; Mr F. C. Barford, vice-chairman; Mr H. Etchells of B.T.H., hon. secretary; Mr A. D. Compston of N.W. Electricity Board, hon treasurer; Mr A. H. Owen, hon relief secretary; and Mr R. T. Greenwood as his assistant.

First Essex Ball

ESSEX branch of E.I.B.A. has decided to hold the first Essex E.I.B.A. Ball this year. It will take place at the Shire Hall, Chelmsford on 8 Oct. and will include a cabaret and running buffet. The branch's hon. secretary, Mr E. E. Cooper, invites Association members and friends to attend, and apply for tickets at £1. 1s. each from him at Millfield, Bentley, near Brentwood.

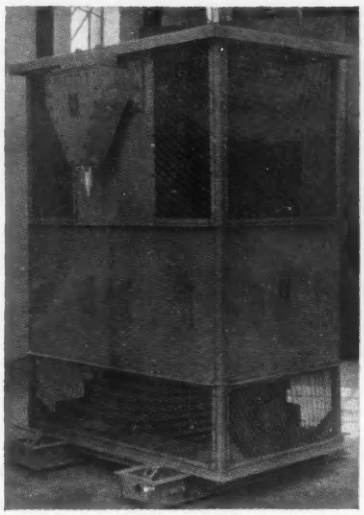
More Profits Shared

FOLLOWING our note of the profit-sharing bonus given to employees of a Keighley manufacturing concern, we hear of a similar award being made by Best and Lloyd Ltd. As a result of that company's profit-sharing scheme, nearly 80 employees have each received wage-packets containing eight extra weeks' pay. The present scheme was introduced in 1950, and prior to that the company had operated a payment-by-results system, but it was found that it led to malpractices and friction. A major development in the firm has been the formation of a Management Board comprising members nominated by various sections of staff.

INTERNATIONAL GROUP'S MEETING IN PARIS

ONCE again the Yardney International Corporation has held their annual meeting for associate members to discuss research developments, progress and improvement of their silver-zinc accumulator. This year the meeting took place in Paris and a full exchange of ideas took place between representatives of the group in six countries. Hosts on this occasion were Andyar Co. and Messrs R. P. Mason and C. L. Chapman represented Venner Accumulators Ltd., of New Malden, Surrey. Other companies involved were Aktiebolaget Silvercell, of Sweden; Silberkraft Leichtakkumulatoren, of Germany; Yardney International Corpn. of the U.S.; and Fabbriche Accumulatori Hensemberger, of Italy.

Discussions during the conference showed the remarkable increase in the number of applications of the group's products in new fields of activity.



Transformers (Watford) 500 kVA, 11 kV distribution transformer, dry type air cooled and with class H. insulation

Fireproof Transformer Tested

MANUFACTURE in this country of the first dry type, air-cooled transformer with all silicone impregnated insulation using only class H. materials is claimed by Transformers (Watford) Ltd. A demonstration of this type of transformer, which eliminates all risk of fire, withstands frequent overloading and can operate at temperatures of 180° C or possibly more, was staged by the company last week. The core and windings of a 500 kVA 11 kV transformer were subjected to a heavy shower of water while at full voltage to show that class H. insulation was completely moisture repellent. The tests took place on a batch of transformers being made under contract for the U.S., where, we understand, this type of transformer has been received with considerable enthusiasm.

NEWS IN BRIEF

Ericsson Telephones Ltd., of Sunderland, have recently obtained a contract for the complete automatic telephone exchange system for the town of Rouyn, near Quebec.

Institution of Civil Engineers has just published (price 25s.) a volume containing the papers submitted at the conference called to consider the causes, effects and remedial measures taken to prevent a recurrence of the Floods early last year.

This year's List of Members has just been published by the Electrical Wholesalers Federation. One copy will be supplied free on request and a charge of 1s. made for each additional copy.

Despite the rain some 8,000 visitors attended the sixth annual At Home at the Witton Works of the General Electric Co. Feature of the day was demonstrations of high voltage phenomena.

Exhibition of Silicones for Industry is to be staged by Midland Silicones Ltd. at Nottingham Technical College from 22 to 26 June.

British Transport Commission announce that as part of the £2 millions programme for the development of lightweight diesel trains, an order has been placed with Metropolitan-Cammell Carriage and Wagon Co. for 36 motor vehicles and 36 driving trailers. These will be fitted with A.E.C. engines and Wilson gearbox transmission made by Self Changing Gears Ltd.

Southampton factory of Pirelli-General held their first family Open Day recently, and over 2,500 employees' relatives and friends took the opportunity to view the cable works.

Annual championship of Essex Business Houses Amateur Athletic Association took place at Colchester on 5 June. All 23 member firms participated and the Challenge Shield was won by Marconi, who beat Ekco, holders of the trophy for the past two years.

In view of references during the past week or two to the private generating plant installed at the Bath and West Show in Exeter, it is perhaps appropriate to note the highly successful display staged at the Show by the S.W. Electricity Board. Open shedding formed three sides of a square and exhibits included an electrical workshop, farm machinery, pig and poultry, horticultural and dairy equipment. Continuous cookery and laundry demonstrations were also held

COMPANY ACTIVITIES

IT is fine to hear from Sir John Dalton, the chairman of W. T. Henley's Telegraph Works, that the long-term prospects for the cable-making industry are good. The freeing of copper from control, with its threat of lower prices, last year retarded the flow of new orders and the company and, indeed, the industry, began 1954 with smaller order books. With hardly a break, and at a bad psychological moment, came the Monopolies Commission report calling for the elimination of some protective practices, but worst of all, revealing to the world the costs, profits, and internal ramifications of the industry.

Fortunately the copper position is clearing up. There has been no drastic fall in copper yet; nor does this seem likely now, despite the U.S. recession. The nationalised and other industries upon which cable makers depend are beginning to realise that cheaper cables (due to a copper price flop) can almost be ruled out. Already there are signs from the long-term programme of B.E.A. that orders should soon be flowing in, in ever greater volume than before the hiatus.

So great has been the demand for more and more electrical power to cope with national increased productivity that new generating plant has secured priority to the detriment of distribution, overhaul and replacement. This policy cannot continue much longer. And when the emphasis changes to the streamlining of distribution, cable-makers who already sell over half of their output in this country, should reap a rich reward. But meantime, in 1954 at least, the profit outlook is doubtful as there still may be repercussions from last year's difficulties.

Full marks go to the Balfour Beatty-Power Securities set-up which has invaded the West, and Canada in particular, in search of new business. It has also secured a further contract from B.E.A. for a major extension of the Staythorpe power station.

Also high marks for the management of the Harland Engineering Co. headed by Mr H. Cowan-Douglas. Quite a sizable proportion of the executive seem to have been out looking for business. Mr Weekes, the unflagging managing director, has found time to visit the Argentine, India, and South and East Africa; Mr Spiro has been to most countries in Europe; other members of the staff have been to the United States, Canada, Finland, Austria and Norway. Result is an order book of £2,650,000 as at 31 Dec. last, sufficient to keep the works fully employed for nearly two years.—*From our City Correspondent.*

W. H. Allen Sons and Co. Ltd.

With a final dividend of 10%, the total distribution for the year ended 31 Dec. last is maintained at 15%, and in addition a bonus of 5% is to be paid. Profit for the year amounts to £805,896, compared with £647,965 for the previous year, according to the preliminary statement.

Barr and Stroud Ltd.

Arrangements are being made to market on the London and Glasgow Stock Exchanges the whole of the £500,000 issued share capital of this concern which manufactures various types of precision units. The capital is in equal amounts of 6% Cumulative Preference and Ordinary £1 shares.

Calcutta Electric Supply Corpn. Ltd.

This concern sold over 1,000 million units in 1953—50 million more than in the previous year, which Sir James Donald, the chairman, considers indicates a return to more normal conditions. He has hopes, too, of a new source of demand for supply—the electrification of railways around Calcutta, to which we have already referred. Revenue from the sale of current during 1953 amounted to £4,919,338 (*£4,704,847*). The sum of £1,234,640 was expended on capital account during the year, mainly on cables and other distribution equipment, as the generating stations are complete and in full working order. The agreement with the Damodar Valley Corporation, providing for a bulk supply at 132 kV was ultimately signed in Apr. last. In the first instance this will amount to 45 MW, to be available if possible by the end of Mar., 1956.

East African Power and Lighting Co.

Stockholders are to be given preferential treatment in an issue of £3,500,000 of debenture stock carrying conversion rights into Ordinary shares. Proceeds of the issue are to be used to repay the £3 millions bank loan and to meet capital commitments already incurred.

Ferranti Ltd.

In announcing a dividend of 6% (*same*) on the Ordinary shares (privately held) for the nine months ended 31 Mar. last, it is stated that the group net profit increased to £546,863 compared with £436,248 a year earlier.

Heatrae Ltd.

There was a severe slump in orders for water heaters during the first six months of the past year, and it became necessary to maintain output on special apparatus which showed a lower gross profit, Mr C. H. Smith, the chairman, explains. But with the reduction in purchase tax the volume of orders for water heaters, both for home and overseas, improved and continues to be satisfactory.

Year to Feb. 28	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	8,084	—246*	—	12½	4/–	3/9
1951	24,903	9,415	33	12½	3/10	3/–
1952	46,022	14,665	53	12½	4/–	3/4
1953	38,400	11,464	39	12½	4/3	3/3
1954	40,384	10,529	35	12½	4/3	4/1

*Loss.

James Howden and Co. Ltd.

It is proposed to make a scrip issue of 1,092,000 10s. Ordinary shares in the proportion of one for every two 5s. stock units held. The new share will be converted into 5s. stock units. Treasury consent has been obtained.

Mexican Light and Power Co.

For the year ended 31 Dec. last the net profit amounts to $3,777,339 compared with $2,461,233 for 1952.

Power Securities Corporation Ltd.

This concern derives its main source of income from the engineering and construction side of the organisation through Balfour Beatty and Co., Ltd., who are busily engaged on power station and similar construction work in Britain, Africa, and other countries. Sir Andrew MacTaggart, the chairman, reports that work continues on an increasing level. The company has now acquired a Canadian concern, as we recently noted. The subsidiaries also report a satisfactory year, notably Duncan Watson (Electrical Engineers) Ltd., and James Kilpatrick and Son Ltd., who are primarily engaged on wiring work.

Year to Dec. 31	£ Trading Profit	£ Net Profit*	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	410,513	109,992	19	6	28/9	24/6
1950	440,166	135,975	26	6	26/9	22/–
1951	535,336	134,835	26	6	28/9	25/3
1952	441,208	136,492	24	7	25/6	19/6
1953	628,802	150,556	25	8	29/–	22/6

*Attributable to parent company.

B. S. & W. Whiteley Ltd.

Reporting an increase in production of 18% due in the main to the facilities which came into service during the last half of the past financial year, Mr W. Whiteley, the chairman, states that it is hoped that during the present year production will not only be maintained but still further increased, with a corresponding increase in the export trade. Manufacturing conditions are more stable and raw materials steadier, but in view of the high prices of the latter compared with 1939 it is still desired to leave the stock reserve intact at £40,000.

Year to Mar. 31	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	166,157	68,786	195	80	80/6	69/–
1951	239,830	107,905	323	100	27/9	18/7
1952	224,747	94,347	70	30*	25/10	20/10
1953	239,934	86,788	61	30	28/3	20/6
1954	326,623	102,494	73	35	29/6	27/6

*Plus 300% capital bonus.

Dividends Declared

Aron Electricity Meter Ltd. Final dividend of 15%, making 20% (*15%*).

Pye (Ireland) Ltd. Final dividend is 12½%, making 15% (*14%*).

ELECTRIC SUPPLY NEWS

B.E.A.

The British Electricity Authority has received the consent of the Minister of Fuel and Power to the establishment of two new power stations, one at Erith and the other at Elland, Yorkshire. The station at Erith, to be known as the Belvedere station, will have an installed capacity of 480 MW made up of eight 60 MW turbo-generators, while the Elland station will have a capacity of 180 MW provided by three 60 MW sets. In both stations, each turbo-generator will be served by a 550 klb/hr boiler unit. The Elland consent also covers the erection of two cooling towers each having a capacity of 3 million gallons of water per hour.

Eire

Work is in hand on the extension of the rural electrification scheme from Ballyshannon to the fior-Ghaeltacht area of Glencolumbkille, Co. Donegal. Engineers of the Electricity Supply Board are mapping out the course of the main line from Carrick to Glencolumbkille, and others are mapping the line to carry current from there through Straleel and on to the Meenaneary-Meenacharvey region, including Malin Beg and Mallinmore.

Gt. Yarmouth

Work has begun on the site at the South Denes for the erection of the new power station. The contract for the foundations, deep water quay and chimney is being undertaken by Peter Lind and Co. Ltd., and will probably take about two years. Foundations will require excavations to a depth of 36 ft. There will be no cooling tower, instead water will be drawn from the river. Initially the station will have two 60 MW generators and two 550 klb/hr boilers.

Northern Ireland

During the first four months of this year almost 600 farms were connected to the power supply of the Electricity Board for Northern Ireland, bringing the total up to 8,564, states the 1953 report of the Northern Ireland Electricity Board. Farms connected numbered 1,448 against 1,328 in the previous twelve months. During the year the Board spent £612,460 on rural development as against £360,222 in 1952. New consumers connected numbered 8,746, of whom 4,975 were rural and 3,771 urban. The total number of consumers at the end of 1953 was 126,235, of whom 50,128 were rural. During the past four years urban consumers increased by 13,374, rural consumers by 20,275 and farms by 5,104. During the year 240 miles of h.t. lines and 208 miles of l.t. mains and distributors were constructed. We hope to publish further details next week.

Shropshire

The Midlands Electricity Board is to spend nearly £150,000 on rural electrification in Shropshire during the current financial year. For the work the Board is augmenting its own o.h. line construction gangs by using outside contractors. In the country there are 6,500 farms, it is estimated, of which just over 1,500 were taking a supply at vesting day. By the end of Mar. last that figure had increased to 2,964 and is now over 3,000. That progress has been achieved despite restrictions on capital expenditure. In Shropshire this year's development programme is divided between four of the Board's districts—Shrewsbury, Wellington and Ludlow districts in the Shropshire and Herefordshire sub-area, and Market Drayton district in the North Staffordshire sub-area. The programme for the Shrewsbury district includes 24 schemes, costing over £51,000 to supply 88 farms and 366 other rural premises. For the Wellington district, there are 27 schemes, to cost over £32,000 to connect 33 farms and 316 other rural consumers, while in the Shropshire part of the Ludlow district there are 22 schemes to supply 82 farms and 304 other consumers at a cost of more than £43,000. In the Board's Market Drayton district, about 200 Shropshire farms have been connected since vesting day, and to deal with the remaining 100 farms a three-year programme, estimated to cost £60,000, has been prepared.

Spilsby

Statements alleged to have been made by Mr H. Payn, district manager of the East Midlands Electricity Board, that the failure of Spilsby Rural District Council to give speedy approval to plans for overhead lines, was holding up electricity supplies in the district, were refuted at the recent meeting of the Council. Apparently Mr Payn has said that more rural development was being carried out in the Boston and Horncastle rural districts than in Spilsby because the Board were getting every support from the Councils there. Amplifying this, he has said that applications to erect overhead lines were dealt with by the Boston and Horncastle officials within a few days, but applications to Spilsby R.D.C. often take weeks. Mr Payn has asked the latter for some procedure to be adopted which would ensure the least delay in the Board being informed of approval or otherwise of their proposals.

West Hartlepool

At a public inquiry into the application of the North Eastern Electricity Board to erect an overhead h.t. line across the corner of the Rift House estate to provide additional power for new plant at the South Durham Steelworks, Mr E. S. Dixon, deputy town clerk of West Hartlepool, maintained that there could be no justification now or in the future for overhead cables being allowed to detract from the appearance of a planned neighbourhood on which thousands had been spent in development. As the land in question is zoned for housing and a school playing fields the Council sought an undertaking that when development does take place the Board would, for the 1,200 ft length in dispute, place the cable underground. For the Board, Mr A. R. Tate said their objection to the condition was purely one of cost. It would cost an extra £800 to put the line underground now or £1,500 to make the change-over later on. But the Board were willing, when the time came, to buy a small strip of land along the edge of the playing field and fence it to make the cable-carrying poles inaccessible. Mr A. H. F. Linton, who conducted the inquiry for the Ministry of Fuel and Power, said the Minister's findings would be announced later.

Sayings OF THE WEEK

"The people of Britain still tend, too often, to think of municipal officials as soulless bureaucrats." . . . MR T. NOLAN in his presidential address at the Nalgo conference.

"It is a woman's place to see that her own cooker is kept clean—it only needs a wipe with warm soapy water and then clean water." . . . MR B. J. SHELL at a meeting of the South Western Gas Consultative Council speaking on a suggestion that the Gas Board should be asked to start a gas cooker-cleaning service.

"Any commercial traveller worth his salt could turn a Russian 'NO' into 'Yes'." . . . LT-COL M. W. BATCHELOR in his presidential address to the United Commercial Travellers' Association.

Lighting Schemes

Boston (Lincs). R.D.C. is installing a further 86 street lamps during the current financial year to complete lighting of existing housing estates.

Halifax. T.C. is applying for consent to borrow £16,000 for provision of sodium lighting in place of the existing lighting in main thoroughfares.

Hastings. The town clerk is contacting the Admiralty concerning the borough's proposals to improve street lighting.

Leatherhead. Ministerial approval has been received to the conversion of street lighting from gas to electricity at a cost of £18,000.

Portrush. The U.D.C. has approved a scheme submitted by the Electricity Board for N. Ireland for fluorescent lighting in the main streets in the town and approach roads leading to it. Estimated cost is £17,000.

Workington. The borough surveyor has been authorised to prepare a scheme for lighting the trunk road, involving 70 lights, at an estimated cost of over £5,000.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

21 June—Glasgow T.C. Supply of V.I.R. and P.V.C. cables, electrodes and lamps for annual supplies to Transport Dept. General Manager, 46 Bath St.

21 June—Liverpool T.C. Supply and installation of a centrifugal disintegrator pumping unit at Halewood sewage works. City Engineer and Surveyor, Municipal Buildings.

21 June—Ossett T.C. Street lighting in Bank and Dale Sts, and Market Place.—See 27 May issue.

21 June—Southall T.C. Sodium lamps, capacitors and transformers; concrete columns with installation of equipment. —Advertised in 27 May issue.

21 June—Sunderland T.C. Electrical installation in 33 houses at Fulwell, Grangetown and Southwick. Borough Engineer, 27 Fawcett St. Deposit £2. 2s.

21 June—West Riding. Rewiring of Ossett grammar school and Stocksbridge senior and J. M. and I. school.—Advertised in 3 June issue.

22 June—Keswick (Cumb) U.D.C. Supply and installation in Main St, of fluorescent lighting units.—Advertised in 27 May issue.

23 June—Bath T.C. Electrical installation in 16 houses on Foxhill estate. City Architect, 7 North Parade Buildings. Deposit £1. 1s.

23 June—Rochdale T.C. Lighting and power installation at Central Library. Borough Surveyor, Town Hall.

23 June—Sidmouth U.D.C. Fluorescent and tungsten filament group B street lighting.—Advertised in 3 June issue.

23 June—West Hartlepool T.C. Electrical installation in shops, houses and maisonnettes on Owton Manor estate. Borough Architect, Municipal Buildings.

24 June—Belfast T.C. Private automatic telephone system at Power Station West. —Advertised in 20 May issue.

24 June—Worcester T.C. Electrical installation at Guildhall. City Engineer and Surveyor, 22 Bridge St. Deposit £2. 2s.

25 June—Dun Loaghaire (Eire) T.C. Supply of one transformer-type 3-phase a.c. electric arc welding plant, with condenser, cables, etc., oil- or air-cooled, up to 200 amps capacity, 220-250 V supply. F. F. MacCarthy, Chief Executive Officer, Technical Inst.

25 June—Pembrokeshire. Electrical installation at New Technical Inst., Neyland. Names by above date to W. Barrett, county architect, County offices, Haverfordwest. Deposit £2. 2s.

26 June—Denny and Dunipace T.C. Supply of steel columns; lanterns, lamps and auxiliary equipment; cable and accessories; under three schedules for 69 units along Glasgow-Stirling Rd. R. J. Dowding, Borough Surveyor, Tower Hse, Denny.

28 June—Birmingham T.C. Rewiring of lighting points on 12 landings and staircases at St. Martin's flats, Balsall Heath. J. P. Macey, Housing Manager, 19-29 Summer Row, Birmingham 3.

28 June—Merton and Morden U.D.C. Supply and erection of about 63 fluorescent and sodium street lighting lanterns with control gear and wiring on 25 ft concrete columns along A.24. Engineer and Surveyor, Morden Hall, S.W.19.

28 June—Ramsbottom U.D.C. 140 W sodium street lighting on trunk road A.56.—See 10 June issue.

30 June—Beddington and Wallington (Sur) T.C. Supply and erection of about 300 totally enclosed 140 W sodium vapour lanterns with lamps, control gear, wiring, 25 ft columns, etc. Borough Engineer, Town Hall, Wallington. Deposit £2. 2s.—Advertised in this issue.

30 June—Manchester T.C. Supply of 12½ cwt passenger lift for Park Hall, Victoria Park. City Architect, Town Hall.

30 June—Kidsgrove U.D.C. Erection only of 16 group B concrete columns, and supply and installation of 150 W mercury discharge lamps, lanterns and accessories at Galleys Bank and Rookery estates. Engineer and Surveyor, Town Hall. Deposit £1. 1s.

2 July—Aberdeenshire. Electrical work in new police station and houses to be built at Turriff. County Architect's Dept., 25 Union Terr, Aberdeen.

3 July—Aberdare U.D.C. Street lighting equipment to replace existing equipment. —Advertised in 3 June issue.

3 July—Mountain Ash (Glam) U.D.C. 9½ miles group A street lighting on main roads.—See 3 June issue.

5 July—Angus. Supply and erection of 11 pole brackets with cable, etc., for street lighting at Inveraldie housing scheme, Tealing.

5 July—Antrim R.D.C. Manufacture and supply of rotary distributor pump and ejector with electric motor and starter gear, valves and penstocks, etc., for proposed sewage works at Killead. Consulting engineers, W. D. R. and R. T. Taggert, Castle Arcade Buildings, Belfast. Deposit £2. 2s.

5 July—Manchester T.C. Installation in residential nursery, Wythenshawe.—Advertised in 10 June issue.

12 July—Aireborough U.D.C. (a) supply and erection of columns and brackets and fitting and wiring of lanterns; and (b) supply of lanterns and auxiliary gear; for 250 W mercury discharge lighting along route A658, about 2¾ miles. Engineer and Surveyor, Council Offices, Micklefield Hse, Rawdon, nr. Leeds. Deposit £2. 2s.—Advertised in this issue.

12 July—Queensbury and Shelf U.D.C. Provision and erection of sodium street lighting equipment including concrete columns and brackets—for about 56 class A points and 6 class B. J. F. Hall, Engineer and Surveyor, Council Offices, Albert Rd, Queensbury, nr. Bradford. Deposit £2. 2s.

19 July—King's Lynn T.C. Two sets of electrically driven vertical spindle borehole type pumps with ancillary equipment, in water development scheme. John Taylor and Sons, Artillery Hse, Artillery Row, Victoria St, Westminster. Deposit £5.

20 July—Epping U.D.C. Installation of electricity in 20 houses.—Advertised in 10 June issue.

26 July—Leeds. Electrical services in new two-storey twin operating theatre unit at County Hospital, York, for Regional Hospital Board. Applications to secretary of Board, Wm. A. Shee, Park Parade, Harrogate, by 23 June. Deposit £2. 2s.

28 July—Ilford T.C. Supply of plant and equipment, from diesel-alternator set to control panels and switchgear, for Roden St, sewage pumping station. Borough Engineer, Town Hall. Deposit £225.—Advertised in this issue.

30 July—Taunton T.C. Sewage and storm water pumping plant, etc.—See 10 June issue.

No date stated—Dereham (Norf.) Wiring of eight houses at Shipdham.—See 10 June issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 119 queries answered this week

"Needlelite" sewing machine motors, makers of? T.E.—Carter Electrical Co., Ltd., Eastern Works, Eastern Ave, Romford, Essex.

"Elegan" hair dryers, suppliers of? E.B. —Nagele's, 8 Broadwick St, W.1.

"L.A.L." stocks and dies, makers of? P.A.—Lehman Archer and Lane Ltd., Hampshire Works, Forest Rd, Barkingside, Essex.

"Sullivan" fires and "Uniglow" elements, makers of? E.E.C.—H. W. Sullivan Ltd., 72 Leo St, S.E.15.

Electric pokers for burning designs on wood, makers of? T.B.C.—There is no standard item being made at the present time for this purpose but soldering irons such as are made by Adcola Products Ltd., Cranmer Court, Clapham High St, S.W.14, could be used.

Magnetic-type air circuit-breakers rated at 5 kV having continuous currrent ratings of 600, 1,200 and 2,000 amps and interrupting capacities of 50, 100, 150 and 250 MVA, makers of? I.E.M.—English Electric Co., Ltd., Queen's House, Kingsway, W.C.2.

"Hitone" buzzers, suppliers of? P.A.—Jack Hinton (Electrical) Ltd., 15/17 Crown St, Bolton, Lancs.

No date stated—Inverness. Supply of lamps in year from 1 July for Inverness Hospitals Board of Management. Apply to E. W. M. Watt, secretary and treasurer, 14 Ardoss St.

No date stated—Ayrshire. Supply of concrete columns; electrical equipment; lanterns for 140 W sodium vapour discharge lamps; and installation work; for trunk road lighting at Kilwinning. Separate schedules. County Engineer, County Buildings, Ayr.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

6 July—Persia. Tenders (No. 430-090131-4261) invited for supply of one diesel electric power plant and all accessories. Procurement Office USOM/1, Lalezar Now, Tehran. B.o.T. (Ref.: ESB 14356/54).*

7 July—Spain. Supply of 20 miles of submarine cable for Ministry of Interior. Firms should contact local agents who should present offers to Registry of Palacio de Telecomunicaciones (G.P.O. Buildings), Madrid. B.o.T. (Ref.: ESB 14262/54).*

7 July—U.S.A. Seattle Board of Public Works invites tenders (No. 1315) for supply of a 100,000 kVA generator for Ross power plants, 90% power factor, 150 r.p.m. 13,800 V, 3-phase, 60 c/s vertical shaft. Board is at County-City Building, Seattle. B.o.T. (Ref.: ESB 14357/54).*

14 Aug.—Australia. Tenders (No. 54-55/1) invited for supply of 220 V transformers and spares. State Electricity Commission of Victoria, 22-32 William St, Melbourne. Deposit £50. B.o.T. (Ref.: ESB 14261/54).*

20 July—Netherlands. Call for tenders will be made for 25 kW generator sets with switchboards, other electrical equipment, cables and telephones; electrically-driven flameproof pumps; valves and flanges; ventilation equipment; piping; fire fighting equipment; control instruments for pumping station; water treatment plant; and electrically-driven air compressors; all in construction of jet fuel depot at Best. Specifications should be ready 1 July and bids should be submitted within three weeks. Contact Directeur Gebouwen, Werken and Terreinen, Ministarie van Oorlog, 40, Bagynestraat, Den Haag.

20 July—New Zealand. Supply of three voltage and phase protective relays, which will operate from 3-phase supply of 400 V between lines and 230 V to neutral. Frequency is 50 c/s. Tender No. P.S.S. 179. Director-General, Stores Div., Post and Telegraph Dept., Windsor Building, Wellington. B.o.T. (Ref.: ESB 14455/54).*

21 July—New Zealand. Stores Div., Post and Telegraph Dept., Wellington, requires (Tender No. P and T 150/6946) three miles enamelled, textile covered telephone cable, quad, lead sheathed, 202 pairs, 10 lb conductors. B.o.T. (Ref.: ESB 14456/54).*

22 July—New Zealand. Supply of 20 miles of wire, stay, galvanised steel (31 ton quality). P and T 150/7040. Director-General, Stores Div., G.P.O., Wellington.

23 July—Uruguay. Tenders (No. 4029/54) invited for supply of 2,000 metres of 220 V armoured cables and accessories. Usinas Electricas y los Telefonos del Estado. B.o.T. (Ref. ESB 14340/54)*

24 July—India. Supply of total of 15,320 iron clad service cutouts, 24,850 outdoor porcelain fuse units, and 1,200 neutral links boxes. Stores Purchase Committee, Govt. of Travancore-Cochin. B.o.T. (Ref. ESB 14314/54)*

2 Aug.—Pakistan. Supply, construction, erection, etc., of a turbo-alternator set with steam raising plant, four boilers and boiler room equipment, switchgear, cables, etc., and spares, for Saidpur power station, Eastern Bengal Railway. Tender No. ENG.X/28029/53. Dept of Supply and Development Govt. of Pakistan, Karachi.

10 Aug.—Portuguese E. Africa. Supply of electrical material for distribution line of Beira Railway general workshop, for Ports, Railways and Transport Dept., Lourenco Marques. Tender No. 90/AB/54. Provisional deposit Esc: 70,000 $00. B.o.T. (Ref.: ESB 13987/54).*

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 15 June

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	239¾	+2¼	252
,, (3 months)	238	+2	—
LEAD, refined pig, min. 99·97% purity (cash)	97½	−1	88⅛
,, (3 months)	94½	−1	83 5/16
TIN, refined, min. 99·75% purity (settlement)	724	—	686½
,, (3 months)	723	−1	681½
ALUMINIUM, ingots 99-99·5%	156	—	161
ZINC, virgin, min. 98% purity (cash)	79⅜	−⅜	70⅛
,, (3 months)	79½	−⅜	69 1/16
RUBBER No 1, RSS. spot (per lb.)	19½d.	+¼d.	20⅛d.
,, c.i.f. basis, ports. August (per lb.)	19 7/16d.	+⅛d.	20d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	51	—	51½
Mild Steel Tape (0·014 in.)	40	—	40

Gazette Announcements

COMPANIES ACTS

S. Oliver and Son (Refrigeration) Ltd. Creditors are asked to send particulars to liquidator, N. W. Osborne, C.A., 11-12 Finsbury Sq, E.C.2, by 19 June.

Rectifiers Co., Ltd. Resolution for voluntary winding-up passed at meeting on 2 June, when H. B. Newton, Nuffield Hse, 41-46 Piccadilly, W.1, was appointed liquidator.

W.E.K. (Electrical) Ltd. Meetings of creditors and contributories will be held at Room 409 of Inveresk Hse, Strand, W.C.2, on 22 June at 12 noon and 12.30 p.m. resp.

Electric Cables Ltd. Resolution for voluntary winding-up passed at meeting on 3 June, when T. J. Bond, C.A., 3 Great Winchester St, E.C.2, was appointed liquidator.

Power Pumps Ltd. At meeting on 4 June resolution passed for voluntary winding-up and L. W. Hellard, 342 Streatham High Rd, S.W.16, was appointed liquidator.

BANKRUPTCY ACTS

Appointment of Trustee

Tunbridge Wells. Jack C. R. Gillitt, electrical contractors trading as C. Gillitt at 19 Stangrove Rd, Edenbridge. Trustee is R. B. M. Knight, C.A., 56a East St, Brighton.

Release of Trustees

London. Matthew T. Woodward, trading with another as M. T. Woodward, electrician and heating engineer at 21 Chaytor Terr, Fishburn. Trustee was W. F. Cresswell, Official Receiver, Bankruptcy Buildings, Carey St, W.C.2.

Canterbury. John G. Elvidge, electrical contractor trading at 31 Wincheap, Canterbury. Trustee was E. C. Williams, INC. ACC., Midland Bank Chambers, Herne Bay.

Intended Dividends

Great Yarmouth. Harry W. Daldry, electrician, trading at 168 Bells Rd, Gorleston-on-Sea, Suffolk. Last day for receiving proofs, 23 June. Trustee is F. R. D. Walter, Official Receiver, Castle Chambers, Opie St, Norwich.

Worcester. Harry Bullock, electrical engineer, trading as H. Bullock and Sons at 17 High St, Bromyard. Last day for receiving proofs, 26 June. Trustee is W. LeR. Hand, Colmore Hse, 21 Waterloo St, Birmingham.

Order Rescinded

Croydon. Henry H. Heckman, electrical engineer of 32 Pollards Rd, Morden. Receiving order dated 2 Oct., 1953, rescinded; petition dated 12 May, 1953, dismissed. Date of rescission, 7 May. Grounds: no good petitioning debt.

Receiving Order

Croydon. John F. Lighton and Alexander R. White, trading together as Heathers at 737 Sidcup Rd, New Eltham, S.E.9, and 119 Old Dover Rd, Blackheath, S.E.3. Date of receiving order, 8 June.

Dividends

Peterborough. Robert V. Mayner, electrical engineer trading in Narrow St, and Wentworth St, Peterborough. Further supplemental dividends of 10¼d. in £ (making 20s. in all) and 4% statutory interest, payable at Official Receiver's Office, 41 Sidney St, Cambridge, on 21 June.

Contracts Placed

Durham. Improvements to electrical installation at Crossgate Hospital, Veal-Nixon, Ltd.

Islington B.C. Reinstatement of forecourt lighting on estates, London Electricity Board, £2,170.

Helensburgh T.C. Conversion of street lighting from gas to electricity, General Electric Co., Ltd., £38,934.

BUSINESS PROSPECTS

Home

Belfast. Construction of intermediate school for girls in Clondare St. J. A. Tynan, quantity surveyor, 68 Royal Ave.

Boldon. J. M. Angus, 21 Lovaine Place, Newcastle-on-Tyne, is architect for proposed office block and laboratory in Cleadon Lane for Insulating Products Ltd.

Bridge-Blean (Kent) R.D.C. Erection of 22 houses at Littlebourne. Engineer and Surveyor, Council Offices, Old Dover Rd, Canterbury.

Coventry. Rider Betts and Sons, Ltd., of West Orchard, Coventry, are to build new premises in Templar and Torrington Aves.

Dartford T.C. Erection of 51 dwellings on Temple Hill Neighbourhood Unit Borough Surveyor, Barclays Bank Chambers, High St.

Dover T.C. Erection of 24 houses at Aycliffe. Borough Engineer, Brook House.

Dunstable (Beds). Work to begin at once at works of Vauxhall Motors Ltd. Extension will cost £2 millions and will occupy 555,000 sq ft.

Elstree (Herts) R.D.C. Approval given to installation of electricity in all pre-war houses. Estimated cost £4,000.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

P. R. Holmes (Electrical Contractors) Ltd., 21 Crown Passage, Pall Mall, S.W.1. Nom. cap.: £100. Dirs.: P. R. Holmes, Florence Holmes, G. A. Holmes and Joan Holmes.

Greeneco Engineers Ltd., North Embankment, Dartmouth. Manufacturers of and dealers in fuel pipes, cables, pipes and tubing and engineering products of all kinds, etc. Nom. cap.: £100. Dirs.: A. C. R. Greene and Mrs B. R. Greene.

Cestrian Handicrafts Supplies Ltd., 121 Front St, Chester-le-Street, Co. Durham. Woodworkers, builders, painters, house furnishers, upholsterers, model and novelty makers, electrical and mechanical engineers, etc. Nom. cap.: £1,000. Dirs.: J. Parsons and G. Sutcliffe.

C. Sandberg and Son Ltd., Hulland St, Leeds 10. Factors of and dealers in electrical equipment, etc. Nom cap.: £10,000. Dirs.: C. Sandberg and R. Sandberg.

Waygood, Waygood and Co. Ltd., 334 King St, W.6. Selling agency for persons, firms and companies engaged in the trades comprised in or connected with the electrical industry, etc. Nom. cap.: £100. Permnt. dirs.: P. E. Waygood and Denise M. Waygood.

Automatic Consulting Engineers Ltd., 17 Dighton St, Bristol 2. Manufacturers of and dealers in appliances, apparatus and equipment required in connection with the breeding and keeping of pigs, agricultural machinery and electrical plant and machinery; consulting and general engineers, etc. Nom. cap.: £1,000. Dir.: Mabel Anderson.

Harrison and Makin Ltd., 18-20 Market St, Bolton. Electrical engineers, etc. Nom. cap.: £25,000. Permnt. dirs.: H. M. Harrison, J. Makin and W. H. Harrison.

J. F. Hillman Ltd., 18 The Broadway, Stanmore, Mdx. Electrical engineers, electrical wiring and installation contractors, etc. Nom. cap.: £3,000. Permnt. dirs.: J. F. Hillman, H. H. Jarvis and Mary J. Nurick.

Epsom T.C. Construction of 28 dwellings in Holman Rd, West Ewell. N. Auty, Borough Engineer and Surveyor, Town Hall.

Farnborough (Hants). C.C. recommended to approve erection of first instalment of Technical College, estimated to cost £133,387.

Hampstead B.C. Plans in hand for erection of 179 flats, 10 maisonnettes, 22 shops and 27 garages in Finchley Rd-Harben Rd area. Architects are Norman and Dawbarn, 5 Gower St, W.C.1.

Kerridge (Ches). W. Chapman Dobson and Partners, Pear Tree Hse, Jordangate, Macclesfield, are architects for new factory for Eric Britton and Co., Ltd., Ingersley Vale, Bollington.

Liverpool. Post Office to be built on Copperas Hill alongside Lime St station. Date of erection not yet fixed.

Neston (Ches) U.D.C. Scheme proposed for development of Liverpool Rd,-Raby Rd, site by erection of 96 flats in 16 blocks and 153 cottages.

Newcastle-on-Tyne. Seven-storey extension costing £350,000 at Rutherford College of Technology to be included in next year's building programme; it is also proposed to erect another 400 houses on Fawdon estate.

N. Ireland. Construction of 4 shops, 14 flats, 2 houses, 6 old people's dwellings, 7 garages and an office at Newtownards, Co. Down. N. I. Housing Trust, 12 Hope St, Belfast.

Oxford. Ministry approval sought for erection of county offices on gaol site, including court, committee room and police headquarters. Scheme is estimated to cost £600,000.

Poole (Dorset) T.C. Plans approved for office block and other buildings for Hamworthy Engineering Co., New Quay Rd, Hamworthy.

Radcliffe (Lancs). Sweetule Products Ltd., of Church St, are to build light industrial factory and offices in Allens Green.

Romford. Sketch plans approved for Brookside county primary school (£102,945), and Rise Park county junior school (£58,850).

Salford. Plans being prepared for Skyscraper flats for Liverpool St site, containing 96 dwellings. Cost estimated at £200,000.

Sheffield. Work to start next month on erection of surgery and therapeutics depts., at University. Cost estimated at £32,000.

Spennymoor U.D.C. Erection of 100 houses on Middlestone Moor estate. Plans by G. H. Gray and Partners, Camden St, North Shields.

Sudbury (Suff.) Additional premises costing about £100,000 to be built at High School for Girls.

West Bromwich. C. E. Fillmore, Waterloo House, Waterloo St, Birmingham, is architect for erection of new factory in Oldbury Rd for Hill (West Bromwich) Ltd.

Westminster. Revised proposals being considered for Churchill Gardens estate comprising 344 dwellings. Powell and Moya, architects, 36 Great Smith St, S.W.1.

Overseas

U.S.A. Mr William B. Dismukes, 125 Velerde, Albuquerque, New Mexico, wants to contact U.K. makers of amateur transmitters, receivers and equipment, with view to examining prospects for commercial distribution in New Mexico.

TRADE NOTES

Holidays. The works and offices of B. and F. Carter Ltd. will be closed from 25 June until 12 July. During this period a reduced staff will be available for urgent enquiries, but it will not be possible to despatch or accept goods.

Change of address. Thorn Industries Ltd., announce that the Midlands' Sales Office of the Atlas Lighting Division has moved to new premises at 23 Sheepcote Street, Birmingham 15. Telephone: Birmingham Midland 5291.

New Phone No. The telephone number of the Harlow works of Sunvic Controls Ltd. has been changed to Harlow 24231/5.

Beama Contract Price Adjustment Formulæ.—*For Electrical Machinery and Equipment.* For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at 12 June, 1954, shall be deemed to be 150s. 6d.; (*b*) "Cost of Material"—the index figure for materials used in the Electrical Machinery Industry published in the Board of Trade Journal on 12 June, 1954, is 158·7.

For Turbo-Generating and Allied Plant. For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at 12 June, 1954, shall be deemed to be 150s. 6d.; (*b*) "Cost of Material"—the index figures published in the Board of Trade Journal on 12 June, 1954, are: Materials used in Mechanical Engineering Industries—149·3; "Blast Furnaces and Iron and Steel Melting and Rolling (40 and 41)"—144. The price of brass condenser tubes, ¾ in. o/d 18 s.w.g. published in *The Metal Bulletin* on 11 June, 1954, is 3s. 6½d. per lb.

For outstanding Contracts covered by the B.O.T. Intermediate Products Index. For purposes of calculating variations in (*a*) "Rates of Pay"—the rate of pay for adult male labour at 12 June, 1954, shall be deemed to be 150s. 6d.; (*b*) "Cost of Material"—the index figure for Intermediate Products published in the Board of Trade Journal on 12 June, is 356·9.

MEETINGS TO NOTE

FRIDAY, 18 JUNE

I.E.E. (London Education).—Exhibition of apparatus. Engineering laboratory of Battersea Polytechnic at 6 p.m.

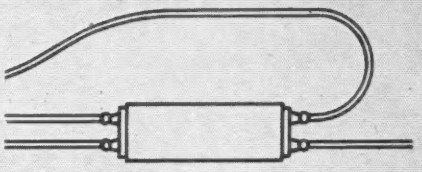
MONDAY, 21 JUNE

Incorp. Plant Engineers (Merseyside and N. Wales).—"Economy in Process Steam," H. E. Lake. Radiant Hse, Bold St, Liverpool, 7.15 p.m.

TUESDAY, 29 JUNE

I.E.E.—Summer meeting in Western Centre, continuing until 2 July.

REDUCE INSTALLATION COSTS!



OLD METHOD

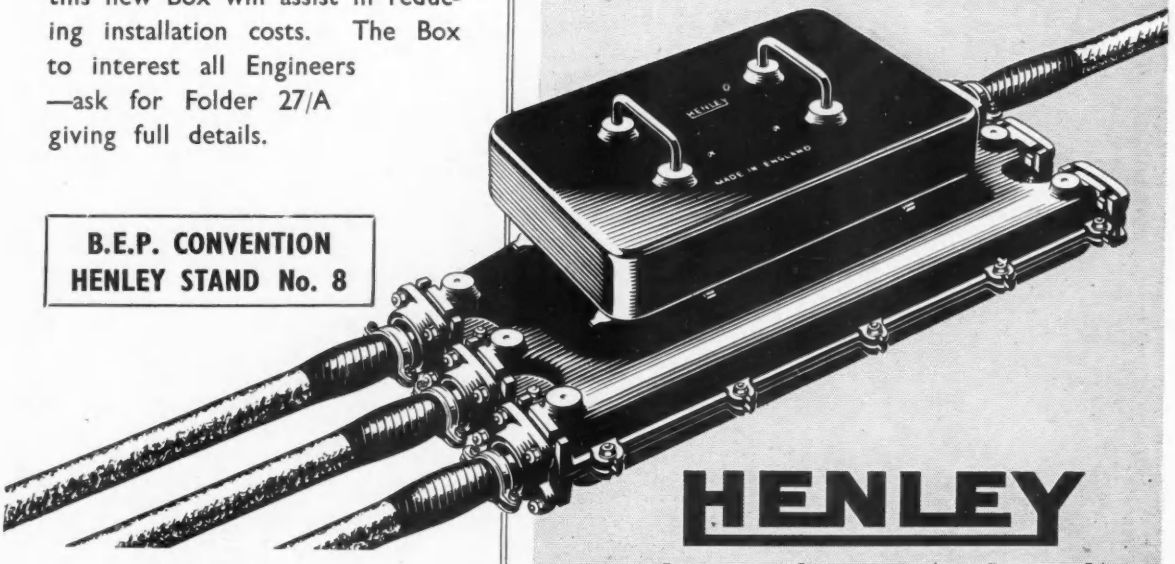
three cables at one end

and one at the other

The new HENLEY 4-way (three-and-one) Underground Disconnecting Box retains all the advantages in design of the well-known range of HENLEY Boxes and, in addition, embodies an entirely new feature enabling three of the four cables to be taken from one end. There are many situations where the advantages provided by this new Box will assist in reducing installation costs. The Box to interest all Engineers —ask for Folder 27/A giving full details.

NEW METHOD WITH HENLEY 4-WAY BOX

B.E.P. CONVENTION HENLEY STAND No. 8



HENLEY

4-way (three and one)

UNDERGROUND DISCONNECTING BOX

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

PHILIPS

Pioneers of
Sodium Lamps
are helping to make British roads safer after dark

RIGHT from the start Philips have pioneered Sodium Lamps—now used so extensively for public lighting, floodlighting and some types of industrial lighting. These Philips Sodium Lamps give up to five times more light than ordinary lamps of similar consumption, providing increased visual acuity, enhanced contrasts and reduced glare.

PHILIPS

PHILIPS ELECTRICAL LTD.

LIGHTING DIVISION, CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2.

LAMPS • LIGHTING • RADIO • TELEVISION • 'PHILISHAVE' DRY SHAVERS
RECORD PLAYING EQUIPMENT • GRAMOPHONE RECORDS
'PHOTOFLUX' FLASHBULBS • ETC.

(1048)

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

AIREBOROUGH URBAN DISTRICT COUNCIL

INSTALLATION OF 250-W MERCURY DISCHARGE STREET LIGHTING ON ROUTE A658 BETWEEN CONEY LODGE, YEADON, AND APPERLEY BRIDGE, RAWDON

Distance—2¼ Miles (Approx.)

TENDERS are invited for the supply and installation of 250 W Mercury Discharge Street Lighting on Route A658 between Coney Lodge, Yeadon, and Apperley Bridge, Rawdon, an approximate distance of 2¼ miles. Separate tenders are invited as follows:

1. Supply and erection of columns and brackets and fitting and wiring of lanterns to columns, etc.
2. Supply of lanterns and all auxiliary gear.

A firm may tender for both, but the Council reserve the right to accept separate tenders from different firms.

Copies of the plan, instructions to persons tendering, specification, bills of quantities, forms of tender and schedule of rates and prices may be obtained from, and general conditions of contract seen at, the office of the Engineer and Surveyor to the Council at the address below on payment of a deposit of two guineas, which will be returned on receipt of a bona fide tender or the return of the documents.

Tenders, enclosed in a plain sealed envelope endorsed "Tender for Street Lighting," must be delivered to the undersigned not later than Monday, 12 July, 1954.

The Council does not bind itself to accept the lowest or any tender, and the acceptance of a tender or tenders will be subject to the obtaining by the Council of any requisite consents.

RALPH H. HULME,
Clerk of the Council.

Council Offices,
Micklefield House,
Rawdon, Nr. Leeds.
18 June, 1954. (K 220)

BOROUGH OF BEDDINGTON AND WALLINGTON

GROUP A STREET LIGHTING

CONTRACT A—Supply of Lanterns and Electrical Gear.

Tenders are invited for the supply and erection of approximately 300 totally enclosed 140 W Sodium Vapour lanterns complete with lamps, control gear, wiring of 25 ft standards (to be supplied and erected under a separate contract) complete with accessories described in the Contract.

The Conditions of Contract, Specification, Bill of Quantities, and form of Tender, together with a set of 6 plans on which the Contractors schemes are to be depicted, may be obtained from the Borough Engineer, Town Hall, Wallington, on receipt of a deposit of £2. 2s. (returnable on receipt of a bona fide tender), the whole to be returned to the undersigned on or before noon on Wednesday, 30 June, 1954. The lowest or any tender will not necessarily be accepted.

A. B. BATEMAN,
Town Clerk.

Town Hall,
Wallington.
10 June, 1954. (K 189)

BOROUGH OF ILFORD

MAIN DRAINAGE SCHEME
RODEN ST PUMPING STATION
SUPPLY OF ANCILLARY PLANT AND EQUIPMENT

QUOTATIONS are invited for the supply of the following equipment for a Sewage Pumping Station to be erected at Roden St, Ilford.

1. Diesel-Alternator Set.
2. Flow Recorders (Venturi Tube).
3. Overhead Runway, block and trolley.
4. Spun C.I. Pipe Rising Mains.
5. Valves and Penstocks.
6. Control Panels, Switchgear and Starters.

Documents may be obtained from the Borough Engineer on receipt of a deposit of £2. 2s. which will be returned on receipt of a bona fide quotation not subsequently withdrawn. Suppliers should indicate for which item or group of items they wish to quote.

Quotations are to be delivered in the envelope provided by or before the first post on 28 July, 1954.

The Council does not undertake to accept the lowest or any quotation.

Town Hall,
Ilford, Essex. (K 228)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, *or a woman aged* 18-59; *unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order,* 1952.

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Board's Southern Sub-Area, based at Beckenham, Kent.

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects; engineering drawing; plant layout in substations; layouts and site plans of mains work; electrical diagrams.

The post is graded under Schedule "D" of the National Joint Board agreement as Grade 6—£458 to £595. 7s. per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46 New Broad St, E.C.2, to be returned completed within 14 days of the publication date of this advertisement. Please enclose addressed envelope and quote ref. V/1749/T. (K 168)

BRITISH ELECTRICITY AUTHORITY
South Eastern Division

SHIFT CHARGE ENGINEER for Brighton "B" Power Station. Applicants must have had sound technical education together with experience in the operation of modern high pressure turbine and boiler plant and E.H.T. Switchgear. P.F. experience an advantage. Administrative ability essential. N.J.B. Conditions Class J, Grade 7, £817 p.a. Applications marked E.T. to the Station Superintendent, Brighton Power Station, Portslade-by-Sea, Sussex, to arrive by 3 July, 1954. (K 221)

CITY OF BIRMINGHAM PUBLIC WORKS DEPARTMENT

APPLICATIONS are invited for the post of HEATING AND VENTILATING ENGINEERING ASSISTANT, Grade A.P.T. V (£620/£670 per annum) or Grade A.P.T. IV (£580/£625 per annum) in the Mechanical Section. Commencing salary will be in accordance with qualifications and experience.

Applicants should be Graduate or Associate Members of the Institution of Heating and Ventilating Engineers or hold Higher National Certificate or equivalent qualifications, and have had experience in the design of heating, ventilating, and allied installations in schools, public buildings, etc.

The posts are permanent, superannuable, subject to a medical examination, and to one month's notice on either side.

Applications endorsed "Heating Assistant" stating qualifications, age and experience, together with the names of two persons to whom reference can be made should reach the undersigned not later than 3 July, 1954.

Canvassing disqualifies.

HERBERT J. MANZONI,
City Engineer and Surveyor.

Civic Centre,
Birmingham 1. (K 181)

THE SOUTH WEST SCOTLAND ELECTRICITY BOARD
Dumfries and Galloway Sub-Area

APPLICATIONS are invited for the following appointments. Salaries and conditions of employment will be in accordance with the National Joint Board Agreement.

(1) SECOND ASSISTANT ENGINEER (CONSTRUCTION) AT SUB-AREA HEADQUARTERS

Salary, Class "G," Grade 8, £678/£704 per annum.

(2) TWO SECOND ASSISTANT DISTRICT ENGINEERS (CONSTRUCTION)

One post in the Annan District, salary Class "D," Grade 7, £633/£642 per annum, and the other in Dumfries District, salary Class "E," Grade 7, £649/£681 per annum.

Applicants should have experience in the planning and erection of substations and overhead and underground lines up to 33 kV in rural and urban areas. The appointments are superannuable and may be subject to a medical examination.

Applications, stating age, quaiifications, training and experience, should be received by the undersigned not later than 2 July, 1954. Applicants should indicate the particular post desired.

W. H. WILLS,
Manager.

Marchmount,
Dumfries.
10 June, 1954. (K 186)

CADETSHIPS IN THE ELECTRICAL BRANCH OF THE ROYAL NAVY

THE next annual competition for Cadetships in the Electrical Branch of the Royal Navy will be held in August for entry in September 1954. Completed application forms should be received by the Admiralty on or before 1 July, 1954.

Candidates must be between the ages of 17 and 19½ on 1 Sept., 1954, and must obtain passes in Physics and Mathematics at Advanced Level in the General Certificate of Education (or equivalents.)

Those selected enter Britannia Royal Naval College as Cadets for one term followed by two terms in the Training Carrier. They then receive a further five years' Naval and Electrical Engineering Training as Midshipmen, Sub-Lieutenants and Lieutenants (L), including three years at University. Subsequently, they receive appointments to the Fleet, design departments and dockyards, are responsible for the maintenance and assist in the design of the electrical and electronic equipment of the Navy. Opportunities exist for promotion to Flag Rank.

Further details may be obtained from the Secretary of the Admiralty, N.C.W. Branch (Cadets), Queen Anne's Mansions, St. James's Park, London, S.W.1. (K 42)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the above position in the South Western District.

Applicants should have had a good general and technical education in building construction and architecture, and experience in the design of small buildings in brickwork and reinforced concrete and the drawing up of specifications.

The post is graded under Schedule "D" of the National Joint Board agreement as Grade 6—£458 to £595. 7s. per annum inclusive of London Allowance, and the commencing salary will be dependent upon qualifications and experience.

Application forms obtainable from Personnel Officer, 46 New Broad St, E.C.2, to be returned completed by 1 July, 1954. Please enclose addressed envelope and quote ref.: V/1701/T, on envelope and all correspondence. (K 188)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited from suitably qualified engineers for the following positions:

SHIFT CONTROL ENGINEER
LONGFORD POWER STATION, COVENTRY
Vacancy No. 85/54/ET

Applicants should have had a sound training and practical experience in a modern Power Station. The possession of technical qualifications is desirable.

Salary will be in accordance with Class G, Grade 10 (£608/£630 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 28 June, 1954.

JUNIOR ENGINEER
AVON POWER STATION, WARWICK
Vacancy No. 77/54/ET

Applicants should be suitably qualified Engineers with some experience in Power Station operation.

Salary for this appointment is £445 per annum within Class E, Grade 14, of the National Joint Board Agreement.

Closing date for receipt of applications 5 July, 1954.

ASSISTANT SHIFT CHARGE ENGINEER
AVON POWER STATION, WARWICK
Vacancy No. 87/54/ET

Applicants should have obtained Higher National Certificate in Electrical and/or Mechanical Engineering and have had experience in the operation of Generating Stations.

Salary for this appointment will be within Class E, Grade 9 (£587/£600 per annum).

Closing date for receipt of applications 5 July, 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box No. 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.
(K 203)

NORTH EASTERN ELECTRICITY BOARD
Harrogate Sub-Area

APPLICATIONS are invited for the appointment of FIRST ASSISTANT DISTRICT ENGINEER, Northallerton. Applicants should have had experience in operation and maintenance of H.V. and L.V. systems. Experience in overhead line construction work also desirable. Salary, Schedule A, Class C, Grade 5, £675/£701. N.J.B. Conditions of Service.

Applications stating age, qualifications and experience should be forwarded to the Secretary, Establishments, the North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle-upon-Tyne, 1, within ten days of the appearance of this advertisement. (K 202)

YORKSHIRE ELECTRICITY BOARD
No. 3 (Sheffield) Sub-Area

SENIOR ASSISTANT ENGINEER
(Meters, Testing and Protection)

APPLICANTS must be Corporate Members of the Institution of Electrical Engineers and the possession of an engineering degree will be an advantage. The duties of the post include the control and organisation of the Sub-Area Meters, Testing and Protection Section. Applicants must have experience in the design of protection schemes and large metering arrangements, also have knowledge of communication equipment. They should be capable of carrying out technical investigations in a wide field of problems associated with electrical distribution systems.

Salary—N.J.B. Class N, Grade 4, £1,300/£1,341 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 1 July, 1954.

No. 6 (Hull) Sub-Area

SECOND ASSISTANT ENGINEER
(Meters, Testing and Protection)

Applicants should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications, have a sound technical and practical knowledge of all types of metering, including instrument technology, and be capable of supervising the work carried out in a Meter Testing Laboratory. Experience in the commissioning and maintenance of protective equipment will be an advantage.

Salary—N.J.B. Class K, Grade 7, £869/£907 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 1 July, 1954.

No. 5 (Wakefield) Sub-Area

WAKEFIELD DISTRICT
DISTRICT COMMERCIAL ENGINEER

Applicants must be conversant with all matters connected with the commercial organisation of a large and mainly industrial district and be experienced in the control of staff. They must have experience in negotiations with large power consumers, in development work, contracting, service centre organisation, consumers' records, the preparation of statistics and reports, and in general management.

Preference will be given to applicants who are Corporate Members of the Institution of Electrical Engineers. The successful applicant will be required to live in the Wakefield District.

Salary—N.J.B. Class F, Grade 4, £850/£887 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 1 July, 1954.

No. 7 (Grimsby) Sub-Area

SECOND ASSISTANT ENGINEER
(Operation and Maintenance)

Candidates should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications and must be fully experienced in the operation and maintenance of H.V. and L.V. overhead and underground transmission and distribution systems, substation plant and ancillary equipment throughout a Sub-Area.

Salary—N.J.B. Class H, Grade 7, £772/£802 per annum.

GAINSBOROUGH DISTRICT
GENERAL ASSISTANT DISTRICT ENGINEER

Applicants should preferably be Graduates of the Institution of Electrical Engineers or hold either the Higher National Certificate in Electrical Engineering or an equivalent qualification. They should have experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems.

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Salary—N.J.B. Class D, Grade 11, £500/£516 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 1 July, 1954.

No. 4 (Leeds) Sub-Area

GENERAL ASSISTANT ENGINEER
(Operation and Maintenance)

Applicants should have had experience in the operation and maintenance of substations, underground and overhead mains in a large urban area and on a rural network.

Graduate membership of the Institution of Electrical Engineers or an equivalent qualification is essential.

Salary—N.J.B. Class K, Grade 13, £583/£605 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than 1 July, 1954. (K 187)

NORTH STAFFORDSHIRE TECHNICAL COLLEGE
Stoke-on-Trent

Principal: H. W. Webb, O.B.E., D.SC.

APPLICATIONS are invited for the appointment of full-time ASSISTANT LECTURER (Grade "B") in Electrical Engineering. Candidates should preferably possess either a Degree, or a Higher National Certificate or its equivalent. Knowledge and experience in the fields of Electronics or Aircraft Electrical Installation Work would be a recommendation.

Salary according to the Burnham Technical Scale, which is now under review. The present salary is £490 x £25 to £765, with full allowances for training, graduate qualifications and industrial experience. Applications giving details of qualifications and experience should be sent to the Principal immediately.

H. DIBDEN,
Clerk to the Governors.
(K 197)

BRITISH ELECTRICITY AUTHORITY
South West Scotland Division

GENERAL ASSISTANT ENGINEER
TECHNICAL DEPARTMENT

APPLICATIONS are invited for a post as General Assistant Engineer in the Telecommunications Section of the Technical Department for maintenance duties on Telephone Installation and Central Indication Systems in the Division. A knowledge of Automatic and Voice Frequency Equipments is essential and candidates should have qualifications of H.N.C. Standard. The salary will be in accordance with Grade 8, Class AX of Schedule "C" of the National Joint Board Agreement—£501/£639 per annum, ultimately rising to £675 per annum.

Applications on Form AE6 which may be obtained from the address below or from any Divisional Office of the Authority should be forwarded to 168, Broomhill Drive, Glasgow, W.1, before Monday, 28 June.

A. CHRISTIANSON,
Divisional Secretary.
10 June, 1954. (K 199)

SOUTH EAST SCOTLAND ELECTRICITY BOARD
Edinburgh Sub-Area Headquarters

REVISED ADVERTISEMENT

SECOND ASSISTANT COMMERCIAL ENGINEER to operate Installation Contracting Department and Appliance Maintenance Service including Repairs Workshop. Preference will be given to qualified Engineers with experience in the foregoing. N.J.B. J.7—£817/£852.

Applications giving age, qualifications and full details of past experience to the Sub-Area Manager, Dewar Place, Edinburgh, 3, within 10 days.

Applications already received will be considered. (K 165)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following positions in the Generation (Operation) Department. N.J.B. service conditions, superannuable appointments, salaries within Schedule "A" of the Agreement:

(*a*) SHIFT CHARGE ENGINEER at Stoke Power Station, Grade E7, commencing at £649 per annum. (Vacancy No. 689MD.)

(*b*) STATION SHIFT CONTROL ENGINEER at Nechells "A" Power Station, Grade F10, commencing at £577 per annum. (Vacancy No. 690MD.)

Applicants for these positions should have received a sound technical training and a thorough knowledge for (*a*) of the operation and maintenance of steam generating plant and main switchgear, and for (*b*) of the control of generating plant and main switchgear. Appropriate technical qualifications an advantage.

Apply on form AE6, quoting the vacancy number available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 3 July, 1954. (K 207)

THE NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF SENIOR ASSISTANT (SUB-AREA SALES SUPERINTENDENT), SUB-AREA CONSUMERS' ENGINEER'S DEPARTMENT, MANCHESTER

DUTIES involve assisting in the general organisation of Sales activities in the Sub-Area particularly to domestic and commercial consumers. Applicants should have had a sound experience in the organisation of service centres and in the planning of sales campaigns.

Salary Scale: £730/£805 p.a. Grade 6, N.J.C. Conditions.

APPOINTMENT OF SECOND ASSISTANT DISTRICT ENGINEER, SOUTH DISTRICT, CHEADLE

The duties will include the supervision of the erection and maintenance of substation switchgear, laying and jointing of cables, and switching operations on the H.V. and L.V. systems within the District as required. Applicants should have had a wide general experience on the distribution side of electricity supply. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £697/£718 p.a. Grade F.7, N.J.B. Conditions.

Applications for the above posts to the Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 26 June, 1954.

APPOINTMENT OF SENIOR SALES REPRESENTATIVE, LEIGH DISTRICT

Duties associated with this position involve advising consumers on their premises on all matters normally concerned with Sales Development, i.e. tariff queries and apparatus sales for domestic and small commercial and industrial applications.

Experience in the application of electricity to agriculture and horticulture would be an advantage.

Possession of the E.D.A. Sales Certificate is desirable and preference will be given to those who have taken courses of study in Electrical Engineering.

Salary Scale: £485/£545 p.a. Grade 2, N.J.C. Conditions.

APPOINTMENT OF ENGINEERING DRAUGHTSMAN, LEIGH

Applicants must have had a good technical training and drawing office experience and should have had experience in the preparation of drawings for some or all of the following:

Switchgear layout and diagrams.
Substation layout and construction.
Overhead line design.
Preparation of wayleave and other plans.

Preference given to applicants holding the O.N.C. in Electrical Engineering and/or Building.

Salary Scale: £433/£567 p.a. Schedule D, Grade 6, N.J.B. Conditions.

Applications for the above posts to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester 3, by 26 June, 1954.

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APPOINTMENT OF ENGINEERING DRAUGHTSMAN, KENDAL DISTRICT

Applicants should have had a good general distribution drawing office experience and be capable of preparing schematic diagrams, profiles, working drawings for rural schemes, and maintenance of records. A knowledge of mechanical engineering would be an advantage.

Salary Scale: £433/£567 p.a. Schedule D6, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by 26 June, 1954.

APPOINTMENT OF SECOND ASSISTANT ENGINEER (SYSTEM PLANNING) SUB-AREA TECHNICAL ENGINEER'S DEPARTMENT, HAZEL GROVE

Applicants should preferably hold the H.N.C. in Electrical Engineering or an equivalent qualification and have had good practical experience in construction, operation and design of underground and overhead distribution systems, including Substations for voltages up to 33 kV.

Salary Scale: £729/£758 p.a. Grade G7, N.J.B. Conditions.

Application forms can be obtained from the Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Electricity Offices, Chapel St, Hazel Grove, Cheshire, and must be returned to him by 3 July, 1954. (K 183)

BRITISH ELECTRICITY AUTHORITY
South West Scotland Division

SECOND ASSISTANT ENGINEER TECHNICAL DEPARTMENT

APPLICATIONS are invited for a post as Second Engineer in the Technical Department.

The duties will relate mainly to specialised testing of Switchgear. Knowledge of Switchgear design. Insulation Testing techniques and short circuit testing procedure is desirable. Candidates should possess good technical qualifications and preferably be a Corporate Member of the I.E.E. The salary will be in accordance with Grade 2, Class AX of Schedule "C" of the National Joint Board Agreement (£834/£970 per annum), eventually rising to £1,025 per annum.

Applications on Form AE6 which may be obtained from the address below or from any Divisional Office of the Authority should be forwarded to 168 Broomhill Drive, Glasgow, W.1, before 12 July, 1954.

A. CHRISTIANSON,
Divisional Secretary.

11 June, 1954. (K 205)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division

VACANCY No. 97/54—FIRST ASSISTANT STATION CHEMIST, Westwood Generating Station, near Wigan. Salary £641/£667 (G.9).

Vacancy No. 98/54—STATION SHIFT CONTROL ENGINEER, Carrington Generating Station, near Manchester. Salary £641/£667 (H.10).

Vacancy No. 102/54—STATION SHIFT CONTROL ENGINEER, Accrington Generating Station. Salary £531/£547 (D.10).

Applications, quoting Vacancy No., to Controller, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 24 June. (K 166)

BRITISH ELECTRICITY AUTHORITY
Headquarters

REQUIRE a GENERAL ASSISTANT ENGINEER in the Generation Plant Design Sub-Branch to assist in investigations into design problems associated with turbines, condensers and feed heaters. Candidates, preferably with a degree in Mechanical Engineering, should have some experience with a manufacturer of one of the above items of plant. Salary N.J.B. Grade 5, £558/£769 p.a. inclusive. Forms from D. Moffat, Director of Establishments, British Electricity Authority, Winsley St, London, W.1, to be returned by 5 July, 1954. Quote reference ET/AE/454. (K 167)

ASSISTANT LECTURER
Electrical Engineering

required by NIGERIA EDUCATION DEPARTMENT for two tours of 18 to 24 months or three tours of 10 to 12 months in the first instance. Option of appointment with (*a*) on agreement with prospect of permanency with salary, etc., according to age and experience in scale £750 rising to £1,315 a year, or (*b*) on contract with salary, etc., according to age and experience in scale £807 rising to £1,453 a year plus gratuity up to £150 a year. Outfit allowance £60. Free passages for the Officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for their maintenance in U.K. Candidates should possess the H.N.C. in Electrical Engineering or equivalent qualification and have had previous teaching and industrial experience. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30630/EE. (K 206)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ENGINEERING DRAUGHTSMEN, with experience in (*a*) the layout of electrical switchgear and substations, or (*b*) building work as applied to industrial or commercial premises, required at the Board Headquarters, Love Lane, Liverpool 3, and No. 1 Sub-Area Headquarters, Hatton Garden, Liverpool 3.

The present salary maximum is £567 p.a., reached by a scale which provides annual increments of approximately £22. Placing at the maximum or within the scale will be determined by qualifications and experience. N.J.B. Technical Staff conditions of service applicable. Appointments superannuable and subject to medical examination.

Applications should be forwarded to the Establishments Officer at Board Headquarters. (K 204)

NORTH WESTERN GAS BOARD
Liverpool Group

SENIOR INSTRUMENT ENGINEER

APPLICATIONS are invited for the above pensionable appointment, at the Central Laboratory, Wavertree Works, Liverpool, at a salary within Grades A.P.T. 11 or 12 (£715/£840 or £765/£890 per annum) according to qualifications and experience.

Applicants should possess suitable technical qualifications in physics or electrical or mechanical engineering, minimum standard Higher National Certificate, and should have a wide experience of installation, maintenance and calibration of all types of industrial instruments. Ability to supervise an Instrument Section covering all the works in the Group is essential.

Apply by letter to the Chief Personnel Officer, North Western Gas Board (Liverpool Group), Radiant House, Bold St, Liverpool, within 14 days. (K 224)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division
(Merseyside and N. Wales)

APPLICATIONS are invited for the appointment of SENIOR DRAUGHTSMAN (Mechanical) in the Construction Department at Springwood House, Woolton, Liverpool. Salary within the range of £567/£671 per annum. Grade 5, Schedule "D" of the National Joint Board Agreement.

Applicants should have a good general and technical education, preferably possess the Higher National Certificate in Engineering and have had some experience in a Drawing Office associated with the construction of modern power stations. Some workshop experience would be an advantage.

The successful applicant will be required to prepare drawings and diagrams associated with power station plant and equipment, and check drawings submitted by contractors.

Application forms may be obtained from the Divisional Controller, Beaconsfield Rd, Woolton, Liverpool, to be returned not later than 24 June, 1954. (K 201)

SOUTHERN ELECTRICITY BOARD

INSTALLATION ASSISTANT

ABINGDON Branch, Oxford District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grade 11, Column 1 (£573 per annum), N.J.B. Conditions of Service.

Applicants should have sound experience in preparation of specifications and estimates for all types of electrical wiring installations, particularly industrial work. Candidates should be competent to supervise electricians and organise allocation of work.

The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, and returned to him in envelopes suitably endorsed not later than July 2, 1954. (K 198)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

Essex Sub-Area

Chelmsford District

ASSISTANT ENGINEER (COMMERCIAL)

Candidates must have a good general and technical education and should preferably possess a qualification not less than the Higher National Certificate in Electrical Engineering. The selected candidate will be responsible to the District Commercial Engineer for sales and commercial development including the preparation of estimates for all types of industrial, agricultural and domestic installations and such general consumer advisory service as is necessary in the district having important industrial, agricultural and housing development.

Salary in accordance with Class E, Grade 6 of the National Joint Board Salary Agreement commencing at £699.

Apply to the District Manager. Eastern Electricity Board, Anchor St, Chelmsford, Essex.

Northmet Sub-Area

Sub-Area Headquarters, London, N.14

(a) ENGINEERING DRAUGHTSMAN SUBSTATIONS DRAWING OFFICE
75/54.R

(b) ENGINEERING DRAUGHTSMAN MAINS DRAWING OFFICE
79/54.N

The duties for (a) include layout of switchgear, transformers and associated equipment for outdoor and indoor type substations up to 33kV.

Candidates for (b) should have had training and experience in overhead line design and layout of associated equipment, survey and route plans, and underground and overhead mains records.

Salary for both appointments in accordance with Grade 6, Schedule D of the National Joint Board Salary Agreement within a range of £433 to £567 plus London Allowance.

Apply to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14.

77/54.R

Hertford District, Royston Service Centre

SENIOR SERVICE CENTRE ASSISTANT

Candidates should be capable of taking charge of a Service Centre, controlling Service Centre staff and handling consumers' inquiries efficiently. They should have extensive sales and consumer service experience and possess a thorough knowledge of appliances, contracting and the application of standard tariffs. The possession of the E.D.A. Salesmanship Diploma or E.A.W. Certificate will be an advantage.

Salary will be in accordance with Grade 2 (£485 by £20—£545) of the National Joint Council Salary Agreement.

Apply to the District Manager, Eastern Electricity Board, Bridgefoot, Ware, Herts.

Enfield District
78/54.N

GENERAL ASSISTANT ENGINEER

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. underground systems.

Salary in accordance with Class F, Grade 11 of the National Joint Board Salary Agreement commencing at £548 plus London Allowance.

continued in next column

continued from previous column

Apply to the District Manager, Eastern Electricity Board, 40 Church St, Enfield, Middlesex.

Future salary and conditions of service for all these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience with details of present appointment and salary, should be submitted to the Manager concerned within fourteen days of the appearance of this advertisement. (K 209)

BOROUGH OF EDMONTON

ELECTRICAL ASSISTANT
BOROUGH ARCHITECT'S DEPARTMENT

THE Council require a suitably qualified Electrical Assistant to take charge of the electrical section of the Borough Architect's Department. Applicants must have had sound experience in practical installations, controlling labour, organising routine maintenance, supervising contracts, designing installations and estimating.

Grade APT. V/Va, £620 by 2 x £15 and 3 x £20 to £710 plus London weighting £10/£30 according to age. 44-hour week.

Applications on forms from Town Clerk, Town Hall, Edmonton, must be delivered by 2 July, 1954. (K 223)

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and N. Wales Division

(Merseyside and N. Wales)

APPLICATIONS are invited for the appointment of STATION CHEMIST at the Ince Power Station, Elton, near Chester. Salary £772/£802 per annum, N.J.B. Class H, Grade 7. Superannuable and subject to medical examination.

Applicants should preferably have had experience in modern power station laboratory work covering the analysis of fuel, water and oil. Possession of a university degree, A.R.I.C. or equivalent qualification is desirable.

Application forms may be obtained from the Divisional Controller, Beaconsfield Rd, Woolton, Liverpool. Closing date: 25 June, 1954. (K 200)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER to be based at Welshpool, required on the No. 4/5 Sub-Area Headquarters staff of the Board. Salary £552/£573 p.a. (N.J.B. J/13). Appointment superannuable and subject to medical examination.

The main duties concern Survey work for rural development. Experience in the layout and construction of H.V. and M.V. overhead lines necessary, particularly in the survey and profiling of routes. Possession of the Higher National Certificate in Electrical Engineering and ability to speak Welsh advantageous.

Standard application forms obtainable from the Manager, No. 4/5 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date: 30 June, 1954. (K 182)

MIDLANDS ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER required in the Wellington District of the Shropshire and Herefordshire Sub-Area. Duties involve the construction, maintenance and operation of E.H.V. and L.V. Mains and Substations and the planning of system reinforcements and mains extensions. Applicants should have had experience with a supply undertaking. Technical qualifications desirable. Salary £587/£600 per annum (N.J.B. Class E, Grade 9). Superannuable.

Apply, in writing, within 14 days stating age, experience, present salary and position to Mr W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary.

10 June, 1954. (K 211)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following posts:

S/13,540

SHIFT CHARGE ENGINEER, EARLEY GENERATING STATION, READING

Applicants should have had previous experience in a large modern generating station, preferably one with high temperatures and pressures and pulverised fuel equipment. Manufacturing works experience will also be an advantage. Candidates should preferably possess technical qualifications admitting to corporate membership of a recognised professional institution.

Salary N.J.B. G/7, £729/£758.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 30 June, 1954. (K 208)

THE RIO DE JANEIRO TRAMWAY Light & Power Co. Ltd.

A BRITISH Company in Brazil, invite applications from suitably qualified men for a post in Rio de Janeiro as TECHNICAL ASSISTANT—Meter Division. Candidates should be between 25 and 30 years of age, and should have a university degree or Higher National Certificate in Electrical Engineering, together with one to five years experience in the Meter Department of a large utility or manufacturer. Salary will be in accordance with qualifications and experience, taking into consideration local cost of living; three years' agreement subject to renewal, with first-class passage both ways; four months' leave on full pay after three years' service. Written applications, which will be treated in confidence, should be made to Mr W. P. Kellett, Joint Manager, Canadian-Brazilian Services Limited, 148 Leadenhall St, London, E.C.3. Applications should be received by 31 July, 1954. (K 231)

APPLICATIONS are invited by the Electrical Research Association from GRADUATES in Physics, Engineering, Mathematics or Physical Chemistry for fundamental and applied research in various applications of electricity. Starting salaries are from £475 to £600 p.a. for those with post-graduate qualifications or from £600 to £800 p.a. for those with higher qualifications. Appointments are eligible for superannuation under the F.S.S.U. Application should be made to the Director, E.R.A. Laboratory, 5 Wadsworth Rd, Greenford, Middlesex. (K 210)

ASSISTANT ENGINEER required to supervise construction of overhead transmission lines and installation of underground cables in Scotland. Only men with experience of all aspects of the work, including survey, need apply. State age and salary expected to Box No. 654, Keith and Co., 137 Princes St, Edinburgh. (K 179)

BOLIVIA. Canadian Electrical Utility operating in La Paz Bolivia, requires services of an ELECTRICAL DISTRIBUTION ENGINEER. Salary 5,600 United States dollars per year. Three years' tour with paid leave. Single or married without children, aged 25-30. Particulars to—Box No. 3613, Electrical Times. (K 185)

CONTROL GEAR DRAUGHTSMEN required for diagram work by firm in North East London. Apply, stating age and experience, to—Box No. 3623, Electrical Times. (K 227)

CROMPTON PARKINSON LTD., Chelmsford, require person capable of dealing with enquiries and orders for automatic and manual starters and control gear, including Automatic Voltage Regulators for use with a wide range of A.C. and D.C. motors and generators. Superannuation scheme, extensive sports, social and welfare facilities. Write stating age, present salary, etc., to the Personnel Officer. (K 214)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.

Transformers (Watford) Limited. wish to make a Senior Sales appointment.
Applicants should be well known in the industry and have held a responsible position in a similar capacity.
Excellent prospects and remuneration.
Apply in confidence to Managing Director, Transformers (Watford) Limited, Sandown Road, Watford, Herts. (K 99p)

CABLE ESTIMATORS required. Age 21/25 years. Knowledge of Electrical Engineering to Ordinary National Cert. level an advantage. 5-day week. Pension Fund. Lunch Vouchers. Apply Staff Officer, W. T. Henley's Telegraph Works Co., Ltd., 51/53 Hatton Garden, E.C.1. (K 212)

CONSULTING Engineers in London require DRAUGHTSMAN for preparation designs, drawings and specifications for lighting and power installations; minimum age 25; salary not less than £625 per annum. Apply with full particulars to—Box No. 3611, Electrical Times. (K 184)

CONTROL GEAR DESIGNERS required for manufacturers in South Midlands. Applicants should have knowledge of motor and machine characteristics and some control gear experience. Salary depending upon qualifications. Staff Pension scheme in operation. Reply giving full details of training and experience to Chief Engineer, Igranic Electric Co., Ltd., Bedford. (K 170)

DRAUGHTSMEN. Igranic Electric Co. being desirous of increasing the size of its Control Gear Drawing Office invites applications for positions as senior and junior draughtsmen. Apply to Chief Engineer, Igranic Electric Co., Ltd., Bedford. (K 169)

DRAUGHTSMAN required for Switchgear development work. Good salary offered to suitable applicant. Pension Scheme available. Reply stating age, salary, full details of technical qualifications and experience to Erskine, Heap and Co., Ltd., Lancashire Switchgear Works, Salford, Manchester 7. (K 192)

DRAUGHTSMAN required as assistant to Design Engineer. This is a unique opportunity for a keen young man with experience in the design and detail of electro-mechanical devices. Applicants must be willing to undertake all duties connected with a Drawing Office, and should be of at least O.N.C. standard. Five-day week, canteen facilities, paid holiday this year. Salary £500/£650 per annum, depending upon experience. Company situated 20 miles north of London. Our staff have been advised of this appointment. Write giving full details to—Box No. 3597, Electrical Times. (K 142)

ELECTRICAL DESIGNERS AND DRAUGHTSMEN required permanently. Experience in lighting and power. Installations for Schools, Hospitals, and other large Institutions. Five day week. Excellent prospects. Interview expenses refunded. Confidential applications to E. G. Phillips Son and Norfolk, Consulting Engineers, Arskus House, Annesley Grove, Nottingham. (K 156)

ELECTRIC Cable Makers, London Area, require SENIOR ESTIMATOR, knowledge works specifications essential. State age, experience and salary required (in confidence) to—Box No. 3615, Electrical Times. (K 193)

ELECTRICAL ENGINEER. For Gold Mine Tanganyika. Experienced man capable organising installation and maintenance of heavy industrial electrical plant. Good knowledge large synchronous motors, transformers, etc., generating plant with associated switchgear and protective equipment, overhead line and underground cable fault location, capable controlling and training unskilled native labour. Salary £80 per month, 30 month contract, generous leave provisions, free passages and living quarters, pleasant climate, reasonable cost of living. Write Box "A.F." c/o J. W. Vickers and Co., Ltd., 7/8 Great Winchester St, London, E.C.2. (K 225)

ELECTRICAL CONTRACTS ENGINEERS required by Cooke and Ferguson Limited, Switchgear Specialists, Manchester.
Vacancies must be filled for posts of Section Leader Level on high voltage contracts work for the B.E.A. and overseas customers.
Applicants must have Higher National Certificate and be able to control a section of the Drawing Office.
Salary rates above association levels resulting from Staff Assessment Scheme for applicants with the satisfactory qualifications.
Reply stating experience and qualifications to Personnel Officer, South St, Openshaw, Manchester 11. (K 175)

ELECTRICAL RESEARCH ASSISTANT. A large organisation in the North West wishes to appoint a young man to evaluate the electrical properties of new insulation products. Possession of Higher National Certificate in Electrical Engineering is desirable. Apply to—Box No. 3619, Electrical Times. (K 219)

ELECTRICAL DRAUGHTSMAN, 25-30, preferably familiar with heavy industrial plant, practice and layout.
Knowledge of distribution systems up to 3,300 V. A.C. and D.C. motor control schemes and preparation of schematic diagrams.
Salary depending on age and experience. Superannuation scheme.
Applications to be received by 19 July addressed to Electrical Engineer, Guest Keen Iron and Steel Works, Cardiff. (K 171)

ESTIMATOR for Indoor Sales Staff required by Crompton Parkinson Ltd., Chelmsford. Applicants must have initiative and be experienced in dealing with enquiries relating to A.C. and D.C. rotating electrical machinery up to 1,500 h.p. /kW. Superannuation scheme, and extensive social, sports and welfare facilities. Write, giving fullest particulars, to the Personnel Officer. (K 213)

FERRANTI LTD. Transformer Department, Hollinwood, have a vacancy in their Moving Coil Regulator Group for a young DESIGN ENGINEER, preferably under 30 years of age, holding at least H.N.C. in Electrical Engineering and with previous experience of design work on the power side. Permanent staff appointment with pension benefits. Application forms from Mr T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote reference TRG. (K 215)

JOHNSON and Phillips require an ESTIMATOR AND TECHNICAL CORRESPONDENT in their Transformer Department. Preference will be given to a man experienced in the preparation of Tenders for the home and export market. Applications giving particulars of training and experience, together with age and salary required to Employment Manager, Johnson and Phillips Limited, Charlton, London, S.E.7. (K 173)

JOHNSON and Phillips Limited have vacancies in their CABLE ESTIMATING DEPARTMENT, preference will be given to men experienced in preparation of estimates of cost of rubber insulated cables and flexibles also thermosplastic cables. Applications giving age, experience and salary expected should be addressed to Employment Manager, Messrs Johnson and Phillips Limited, Victoria Way, Charlton, London, S.E.7. (K 135)

LONDON Consulting Engineer requires ELECTRICAL ENGINEER for design of installation work in factories, schools, office buildings, etc. Previous experience in Consultants or similar establishment an advantage. Superannuation Scheme. Write stating age, experience, qualifications and salary required to G. H. Buckle and Partners, 2 Harrington Gardens, London, S.W.7. (K 218)

MANAGER for Electrical Repair and Maintenance organisation in N.E. Lancashire. Applicant must have Repair Shop experience and be capable of handling maintenance contract work.—Box No. 3589, Electrical Times. (K 121)

MAINTENANCE MANAGER required for electrically driven Cotton Spinning, Doubling and Weaving Mills situated in Pendleton, Patricroft and Blackburn; only applicants with good electrical experience and qualifications will be considered; duties include maintenance of buildings and a wide variety of machinery; starting salary will be commensurate with ability and experience; age preferably 35 to 40; contributory pension scheme; applications must be in writing giving full details including experience, technical qualifications, age and references to Sir Elkanah Armitage and Sons Ltd., Broughton Rd, Salford 6, Lancashire. (K 191)

MECHANICAL DRAUGHTSMAN wanted for factory in West Midlands. Permanent and pensionable post, attractive working conditions. Maximum salary approximately £730 p.a. Experience of design of malleable castings an advantage. Apply, giving particulars of age, qualifications and experience, to—Box No. 3621, Electrical Times. (K 226)

OUTSIDE SALES ENGINEER required by company manufacturing electrical rotating machinery one to 100 h.p. The successful applicant will be based at Loughborough, Leics, and will have to cover the East Midlands area. Possession of Ordinary National Certificate in Electrical Engineering is a necessary qualification and previous experience of this range of products is essential. Salary dependent upon qualifications and experience. Non-contributory superannuation scheme.—Box No. 3607, Electrical Times. (K 172)

PIRELLI-GENERAL Cable Works Ltd. have vacancies for ENGINEER AND ASSISTANT ENGINEERS having experience in construction of Steel Tower Transmission Lines. Applicants must be willing to travel. Apply in writing giving full particulars of experience, etc., and salary expected, to Overhead Lines Department, Eastleigh, Hants. (K 216)

PIRELLI-GENERAL Cable Works Ltd. have a vacancy for a capable GENERAL FOREMAN with sound experience in construction, supervision of labour and all round organising ability for erection of Steel Tower Transmission Lines. Apply in writing giving details of experience, etc., and salary expected to Overhead Lines Department, Eastleigh, Hants. (K 217)

SERVICE ENGINEER required by well known manufacturer of Domestic and Heavy Duty equipment. Apply giving details of experience and salary required to—Box No. 3609, Electrical Times. (K 174)

TECHNICAL ASSISTANT (Electrical) required for Central London Office to be engaged on the design, installation and commissioning of factory electrification schemes, including generation on site and/or Public Supply, substations, H.T. Ring Mains, Transformers, M.T. switchboards, cabling, distribution boards, motors, starters, lighting, automatic telephones, electronic process controls, etc.
Applicants should be between 25 and 30 years of age and must hold the H.N. Certificate in Elect. Eng. Preference to man holding the Graduate Examination of the I.E.E. Five-day week. Superannuation Scheme. Salary according to experience. Successful applicant would have to be passed by the Company's Medical Officer.
All applications will be treated in the strictest confidence, and should be addressed to Personnel Division (WAD 64), Unilever Ltd., Unilever House, Blackfriars, London, E.C.4. (K 190)

TECHNICAL ASSISTANT required by Cable Manufacturers to work on the development and testing of High Frequency cable and cable accessories. Previous experience would be useful but not essential. O.N.C. in electrical engineering. Pension scheme, five-day week. Salary in accordance with age and qualifications. Apply in writing to: Staff Officer, Telegraph Construction and Maintenance Co., Telcon Works, Greenwich, S.E.10. (K 157)

SENIOR ELECTRICAL DRAUGHTSMAN required for research and development work at Havering, Romford. Sound experience in power wiring and layouts essential. Application in writing, giving full personal details to Ilford Limited, Romford, Essex. (K 96)

APPOINTMENTS FILLED

BERMUDA ELECTRIC LIGHT CO., LTD. Applicants are informed that both posts previously advertised have been filled. (K 195)

LEADING Domestic Appliance Manufacturer, Box No. 3599. This vacancy has now been filled.

M.K. ELECTRIC LTD. Applicants are informed that the post of Representative has now been filled.

SAN SALVADOR. Applicants are informed that the post advertised has been filled. (K 196)

APPOINTMENTS WANTED

ELECTRICAL ENGINEER with Consulting Engineering experience seeks appointments. Inspections, Reports and recommendations, site supervision, etc. Fees reasonable.—Box No. 3563, Electrical Times. (K 35)

ARGENTINA. Chartered mechanical electrical engineer, British, 56, fluent Spanish, own city offices, would handle firm's S. American projects, appraisals. Write DBP, B. Mitre 341, Buenos Aires. (K 178)

WANTED

12 and 15 h.p., 3-ph., 400 V, A.C., 50 c., 900/1,200 r.p.m. Motors wanted. Green Bros. (Electrical) Ltd., Brackley, Northants. (K 38)

SURPLUS Electrical Stocks bought for cash.—Box No. 3567, Electrical Times. (K 39)

WANTED, D.C. and A.C. ball-bearing MOTORS, motor generator sets, dynamos and alternators.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London, N.1. (K 3)

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (K 4)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (K 1)

WANTED—Scrap Lead, Brass, Copper; top prices: Recovered Mercury (quicksilver) 15s. lb upwards. Spot cash on delivery, or cash on collection arranged Greater London area: also Platinum and Silver Contacts, precious and non-ferrous scrap metals in all forms. Belgrave Buyers (E.T.), 5 Belgrave Gardens, London, N.W.8. MAI 7513. (K 176)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (K 10)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (K 15)

FISHER FOUNDRIES LTD., Greet, Birmingham 11, for Machine Moulded Precision Castings in gun metal and soft grey iron. Tel.: Victoria 0197. (K 18)

CABLE JOINTING, up to and including 11 kV. Specialists on installations where aluminium cabling is specified. First class workmanship guaranteed, terms very reasonable. Special concessions to Private Electrical Contractors. Replies and enquiries to—Box No. 3625, Electrical Times. (K 229)

METALWORK. All types cabinets, chassis, racks, etc., to your own specification.—Philpott's Metalworks Ltd., Chapman St, Loughborough. (K 180)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (K 13)

FOR SALE

ELECTRICITY SUPPLY BOARD IRELAND

SALE OF PLANT SPARES

THE Electricity Supply Board has for disposal at its Pigeon House Generating Station, Dublin, steel tubes for boilers, etc., copper piping, condenser tubes and various spare parts for boilers and coal handling plant.

Full particulars and conditions of sale may be had on application to the Supplies Engineer at the Board's Central Stores, Lower Erne St, Dublin.

Offers for the lots should be enclosed in sealed envelopes endorsed "Tender for Plant Spares ex Pigeon House," and should be delivered to the undersigned not later than twelve o'clock noon on Wednesday, 7 July, 1954.

The Board does not bind itself to accept the highest or any offer.

PATRICK J. DEMPSEY,
Electricity Supply Board, Secretary.
27 Lower Fitzwilliam St,
Dublin. (K 177)

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. Specification 214 or individual requirements. — Blickvac, 505 Lordship Lane, S.E.22. Tel: Forest Hill 7089. (K 14)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (K 6)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Rd, East Dulwich, S.E.22 (Forest Hill 2278-9). (K 2)

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—Chi. 5105, 67 Rothschild Rd, W.4. (K 5)

DIESEL GENERATING set 7·5 kVA 240 V, single-phase, 50 cycles. Seen Hertfordshire. Telephone Barlett, Dane End 26. (K 222)

DON'T worry about your electricity bills. Fit 1s. slot electric meters for hotels, bed-sitters, etc. Prices from 50s.—Selectrics, Department E.T., Castle Circus House, Torquay. Tel. 7218. Trade inquiries invited. Trade discount. (K 16)

DON'T forget reconditioned METERS are supplied by The Electric Meter Company, Dept ET46, Castle Circus House, Torquay. (K 109)

FLUORESCENT BALLASTS—wide range —20 W, 30 W, 40 W, 80 W. Normal and high power factor. Built for long and dependable life—Optimum Performance—Quiet operation. Fully impregnated—Progressive compounding—Heavy encased housing—Quick deliveries. Data on request. Micramatic Ltd., Bournemouth, Hants. (K 20)

GRUBB IMMERSION HEATERS by return of post to your address. Let us send you our latest list and trade terms of these quality products. John Owner and Co., Ltd., Springfield Rd, Birmingham 13. Tel. SPRingfield 2939. (K 25)

HOUSE SERVICE METERS. The Electric Meter Company, Dept. ET46, Castle Circus House, Torquay. (K 108)

FLAMEPROOF MOTORS, M.G. SETS. D.C. MOTORS, GEARED MOTORS, A.C MOTORS, TRANSFORMERS, CONTROL GEAR. SPECIALS. FLANGE MOTORS

ELECTROPOWER COMPANY LIMITED

Kingsbury Works, Kingsbury Rd, London, N.W.9
Tel.: COLindale 4621/3,
Grams: Lectropowa, Hyde, London (K9p)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (K 7)

MERCURY SWITCHES are made by Hall, Drysdale and Co., Ltd., of 58 Commerce Rd, Wood Green, London, N.22. Tel.: BOW. 7221. (K 8)

METERS reconditioned, all types, AC/DC, quarterly credit single and three-phase 3/4 wire 2½/100 amp. Prepayment, single dual and triple coin, fixed or variable tariff 2½/50 amp. Delivery ex-stock, guaranteed, free catalogue lists 200 types. Trade Discount 33⅓%. The Electric Meter Company, Dept. ET46, Castle Circus House, Torquay. Telephone 7963. (K 107)

ONE Metro Vick 500 kW ROTARY CONVERTER 460/515 V, D.C. 1025/970 amps, 6-phase, 50 cycles, 1,000 r.p.m. Serial No. 647900. (Requires partial armature rewind.)

One Metro Vick Transformer for the above, 550 kVA, 6600/365 V, 48/502 amps, 6-phase, 50 cycles, Vector Group 51YYY.

One A.C. Automatic Starting Panel for the above (M.V.).

One D.C. panel for the above (M.V.).

One H.T. Oil Circuit Breaker for the above. Metro Vick 6,600 V, 300 amps, 50 cycles, 3-phase A.C. Relay—5 amps, O.V. Relay—110 V. Serial No. D61423.

Box No. 3605, Electrical Times. (K 160)

PURLEY CHOKES AND BALLASTS. Our 80-W tapped h.p.f. ballast with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (K 11)

TIME SWITCHES for sale. Reconditioned or new. 12 months' guarantee. Immediate delivery. List from: J. W. Hughes, 3 St. Thomas' St, London Bridge, S.E.1. (Tel.: HOP 2759.) (K 21)

54 TUDOR ACCUMULATORS from 110 V lighting set shortly available; new positive plates 1949; also approximately 1,600 yds electric o/h wires; Mandsley Patent. 110 V Dynamo. Further details apply Peckover Burrill and Owen, Chartered Land Agents, Denbigh. (K 148)

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AGENCIES

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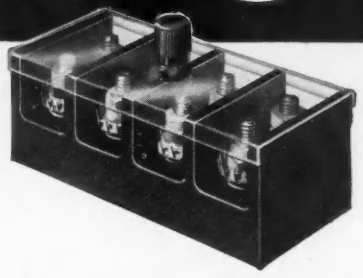

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INDEX TO ADVERTISERS

Aberdare Cables Ltd. 34
Adcola Products Ltd. 2
Aerialite Ltd. 33
Allied Ironfounders Ltd. 36
Arora Co.... 100
Ash & Lacy Ltd. 12
Association of Steel Conduit Manufacturers 89
Auchterlonie, Chas., & Co., Ltd. ... 86
Austin Taylor Electrical Ltd. 85

Babcock & Wilcox, Ltd. 20
Backer Electric Co. Ltd. 12
Batt Electrical Co. 11
Belling & Co. Ltd. 6
Benjamin Electric Ltd. ... ... *Cover* (ii)
Bray, Geo., & Co. Ltd. 104
British Electric Resistance Co. Ltd. ... 16
British Electricity Authority 14
British Insulated Callender's Cables Ltd. 30
British Power Transformer Co. Ltd. ... 68
British Thomson-Houston Co. Ltd. 41, *Cover* (i)
Brookhirst Switchgear Ltd. 91
Browning's Electric Co., Ltd. 87
Brush Electrical Engineering Co. Ltd. 106
Bryce Electric Construction Co. Ltd.... 45
Burco Ltd. 54
B.V.C. Industrial Constructions Ltd. ... 26

Cable Makers Association 70
Carter, B. & F., & Co., Ltd. 86
Castle Engineering Co. (Nottingham) Ltd. 98
Chase Products (Engineering) Ltd. ... 44
Cole, E. K., Ltd. 44
Cooper & Co. (Birmingham) Ltd. ... 22
Cowanite (Anti-Corrosive) Ltd. ... 44
Cressall Manufacturing Co. Ltd. ... 12
Crockatt, W., & Sons Ltd. 62
Crompton Parkinson Ltd. 67

Davenport Engineering Co. Ltd. ... 26
Dewrance & Co. Ltd. 5
"Diamond H" Switches Ltd. 102
Dorman & Smith Ltd. 69

East London Mica Works 104
Edge, Arthur, & Co. Ltd. 2
Edison Swan Electric Co. Ltd. 25
Eeto Insulations 94
Ekco-Ensign Electric Ltd. 13

Electrical Times Ltd. 85, 106
Electro-Mechanical Mnfg. Co. Ltd. 28, 29
Electro Methods Ltd. 100
E.M.S. Electrical Products Ltd.... ... 72
Enfield Cables Ltd. 42, 43
English Electric Co. Ltd. 15
Erskine, Heap & Co. Ltd. 74

Ferranti Ltd. 37
Fibreglass Ltd. 75
Film Cooling Towers (1925) Ltd. ... 2
Fischer Bearings Co., Ltd. 18
Foster Transformers Ltd. 71

General Electric Co., Ltd. 51, 76, *Cover* (iv)
Genristo Ltd. 98
Gent & Co. Ltd. 49
Gibson Todd & Co. Ltd. 93
Glover, W. T., & Co. Ltd. 47
Green, E., & Son Ltd. 103
Grelco Ltd. 106
Gresham Transformers Ltd. 60

Hedin, Ltd. 52
Henley's, W. T., Telegraph Works Co. Ltd. 77
Higgs Motors Ltd. 10
Hillman Electric Motors Ltd. 90
Holman, Michell & Co., Ltd. 72
Holme, Edward, & Co. (1931) Ltd. ... 108
Hopkinsons Ltd. 3
Hotpoint Electric Appliance Co. Ltd.... 95
Howden James & Co., Ltd. 17

Isenthal & Co. Ltd. 90
Ivor Power Specialty Co. Ltd. 35

Jackson Electric Stove Co., Ltd. ... 31
Johnson & Phillips Ltd. 21

Kersons Mnfg. Co. Ltd. 7

Laurence, Scott & Electromotors Ltd... 23
London Electric Firm Ltd. 100
Low, Duncan, Ltd. 68
Lyons, Claude, Ltd. 88

Martindale Electric Co. Ltd. 88
Mather & Platt Ltd. 16
Metropolitan-Vickers Electrical Co. Ltd. 4
Midland Electric Manufacturing Co., Ltd. 19

Nettle Accessories Ltd. 92
Nife Batteries 1

Parmiter Hope & Sugden Ltd. *Cover* (iii)
Partridge, Wilson & Co. Ltd. 107
Philips Electrical Ltd. 78

Plasticable Ltd. 108
Plessey Co., Ltd. 38
Power Centre Co., Ltd. 92
Process Control Gear Ltd. 96
Purrmann, F. A., & Herr, G.m.b.H. ... 26
Pyrene Co. Ltd. 90

Record Electrical Co. Ltd. 27
Rentweld Ltd. 52
Resistances Ltd. 32
Reyrolle, A., & Co. Ltd. 65
Rowlands Electrical Accessories Ltd. ... 94

Santon Ltd. 88
Sax, Julius, & Co. Ltd. 68
Siemens Electric Lamps & Supplies Ltd. 110
Siemens-Schuckert (Great Britain) Ltd. 8, 9
Simon-Carves Ltd. 57
Simplex Electric Co., Ltd. 58
Smith, Frederick, & Co. 97
Smiths Industrial Instruments Ltd. ... 62
Spencer Wire Co. Ltd. 102
Standard Telephones & Cables Ltd. ... 101
Stanhope Box Co., Ltd. 108
Statter, J. G., & Co. Ltd. 63
Steatite & Porcelain Products Ltd. ... 66
Stewarts & Lloyds Ltd. 39
Sturdy Electric Co. Ltd. 32
Sunvic Controls Ltd. 55
Symons, H. D., Ltd. 64

Thermodare (Gt. Britain) Ltd. ... 62
Thew, Edward H., Ltd. 106
Thomas Richard & Baldwins, Ltd. ... 40
Thorn Electrical Industries Ltd. ... 109
T.I. Aluminium Ltd. 56
T.M.C.-Harwell (Sales) Ltd. 53
Tok Electrical & Industrial Mechanisms Ltd. 22
Transformers (Watford) Ltd. 50
Tubela Engineering Co., Ltd. 59
Tucker, Geo., Eyelet Co. Ltd. 64
Tucker, J. H., & Co. Ltd. 73
Tudor Accumulator Co. Ltd. 48
Turners Asbestos Cement Co. Ltd. ... 61
Turnright Controls Ltd. 46

Universal Boilers & Engineering Co. Ltd. 32

V.G. Porcelain Co. Ltd.... 94
Volex Electrical Products Ltd. 105

Ward, Thos. W., Ltd. 99
Washers Ltd. 108
Wootton & Co. Ltd. 96

Yorkshire Electric Transformer Co. Ltd. 24

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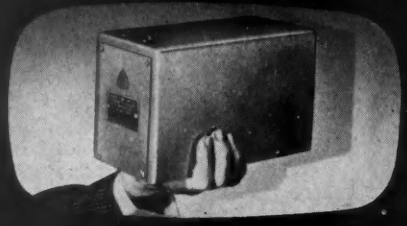

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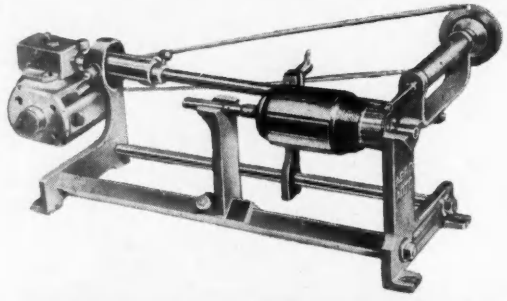

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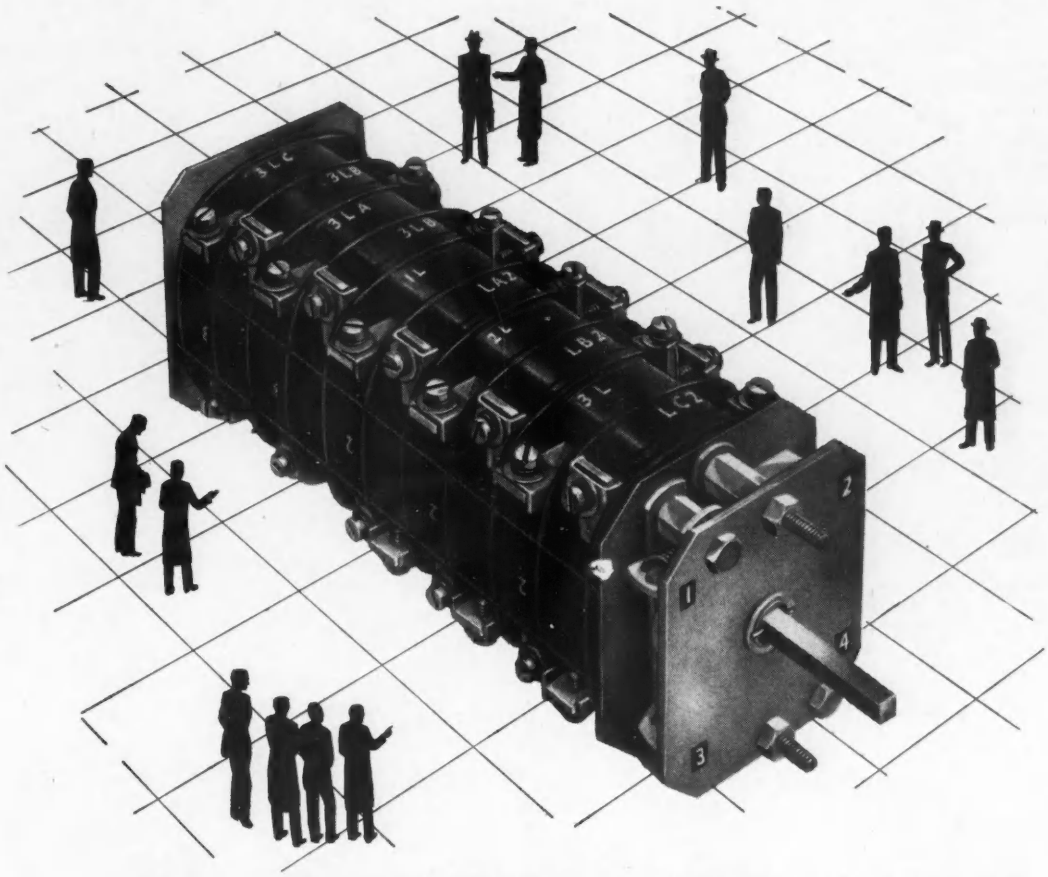

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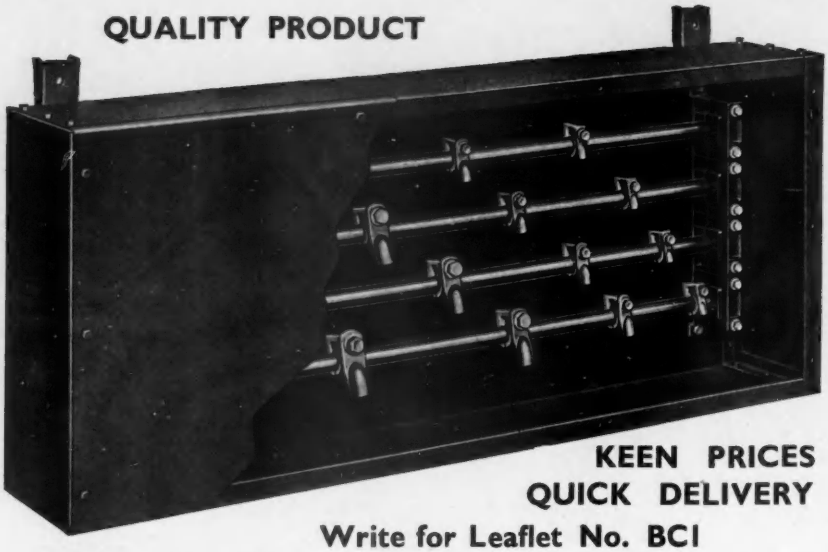

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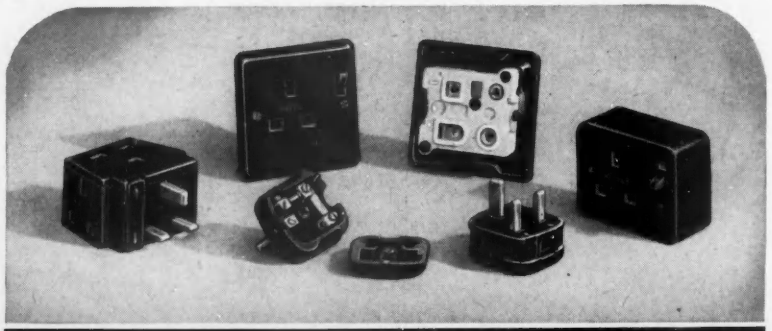

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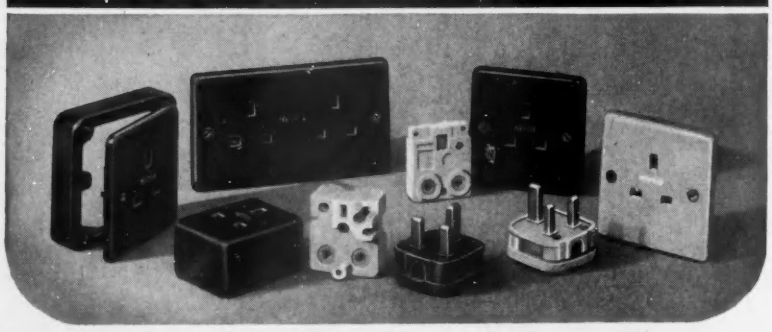

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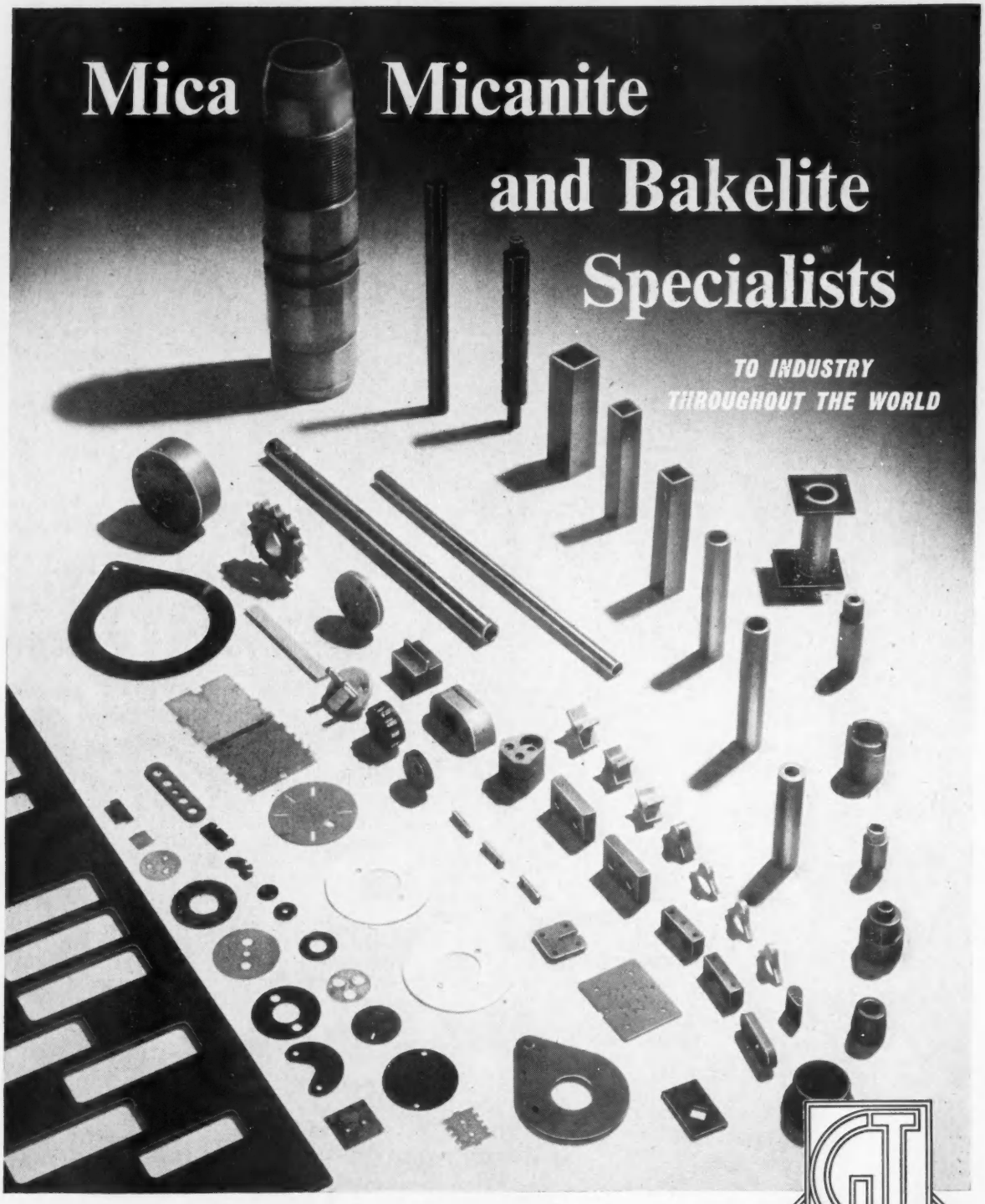

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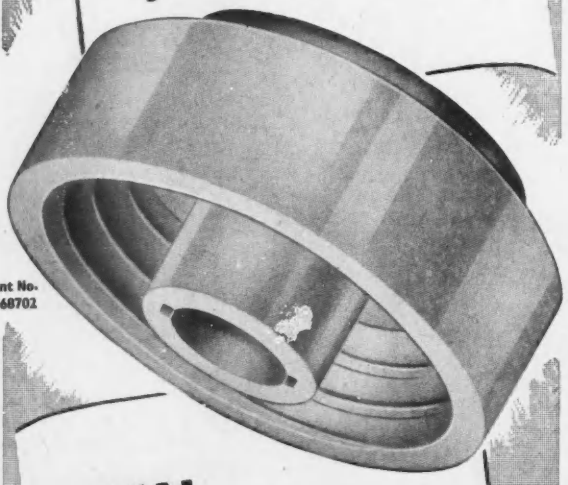

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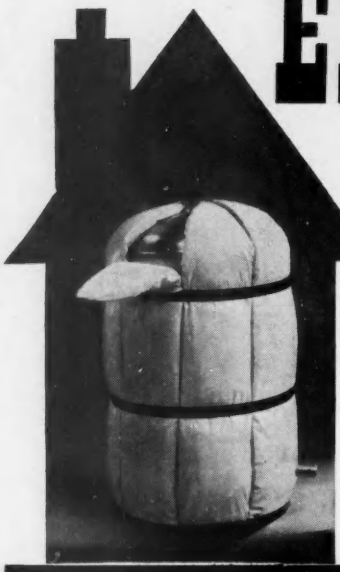

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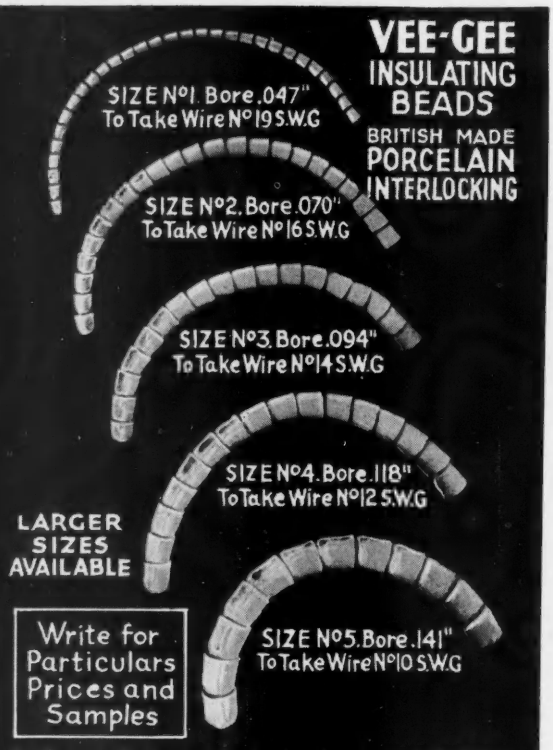
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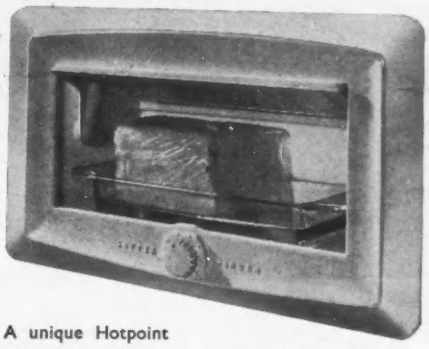

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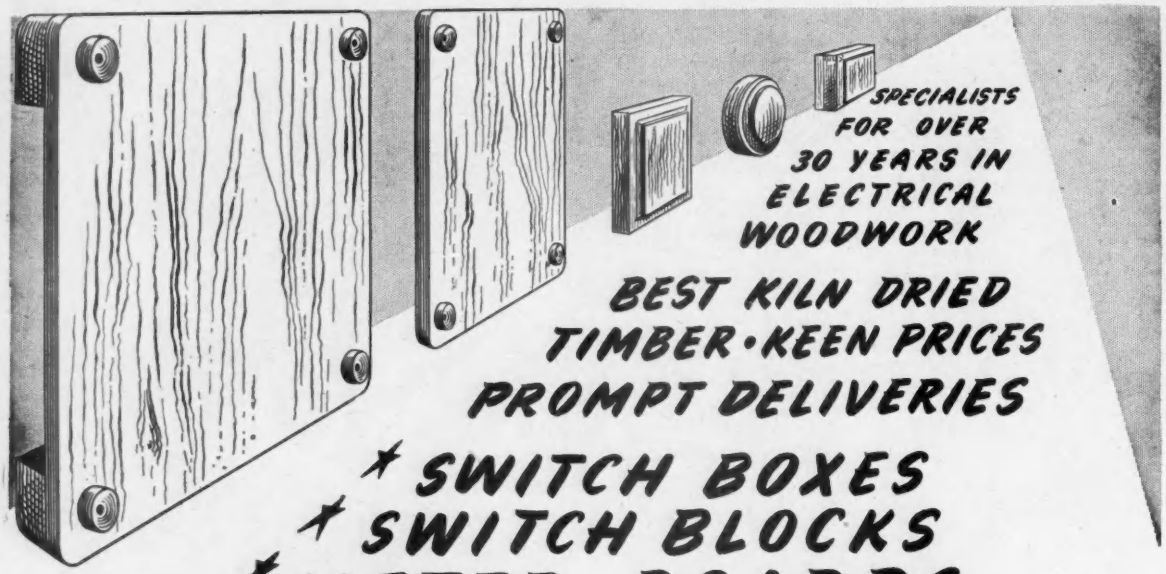

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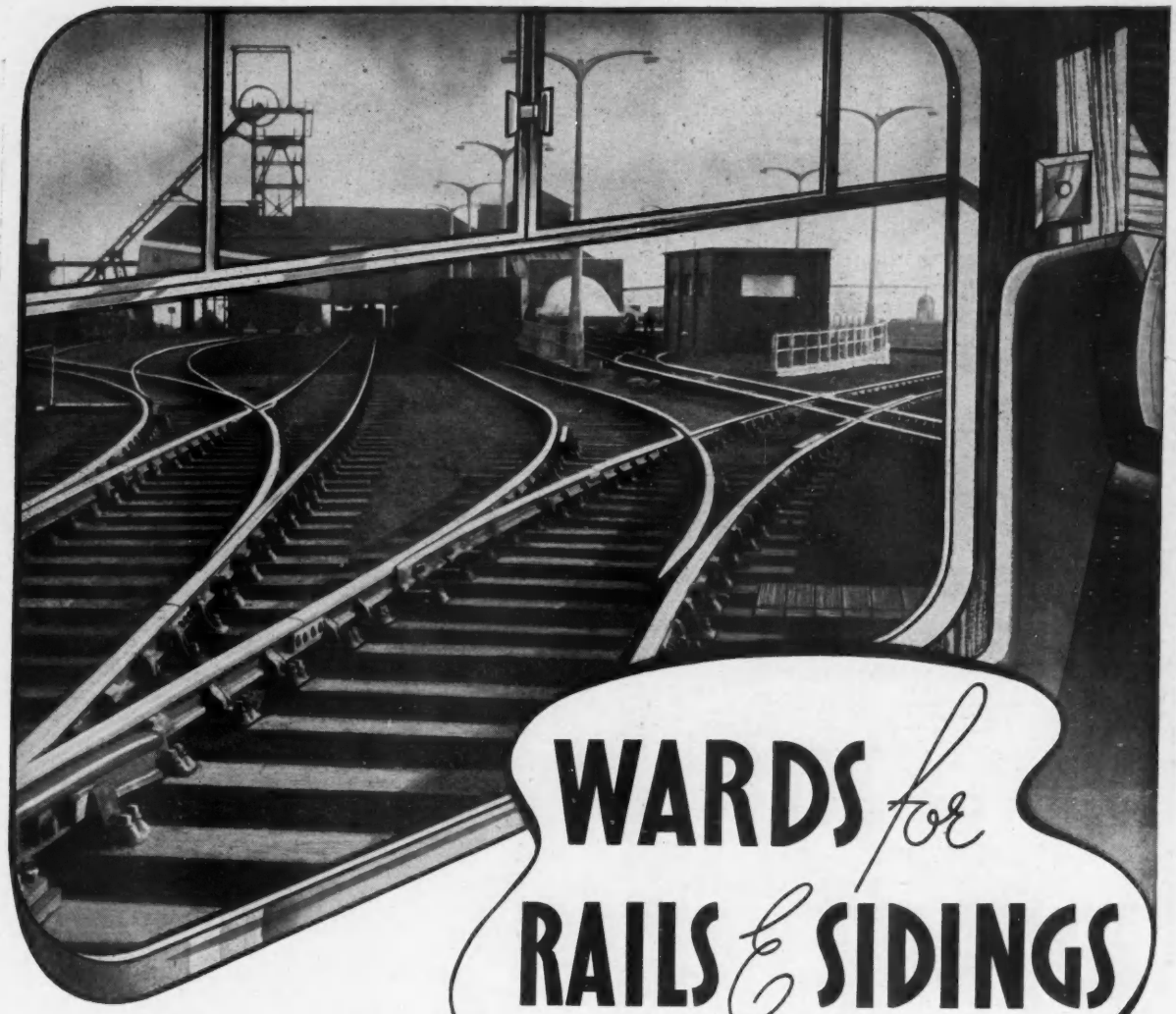

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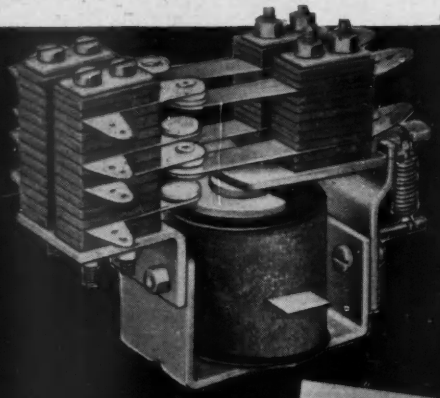

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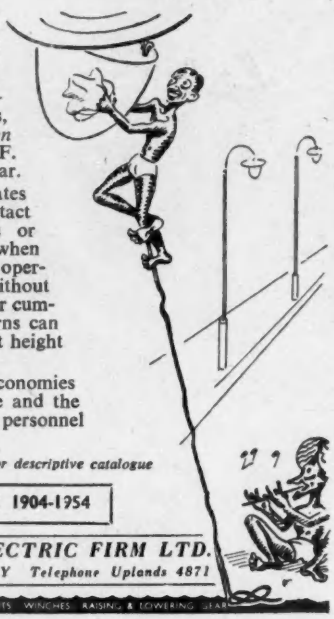

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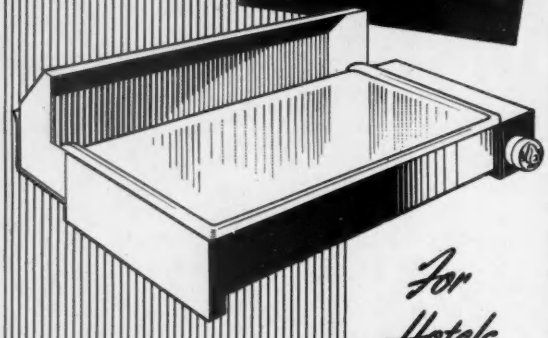

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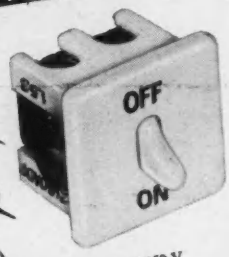

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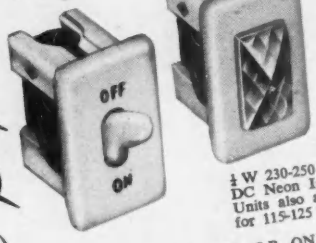

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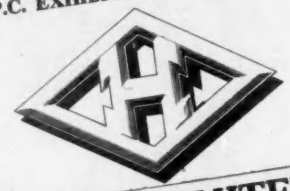

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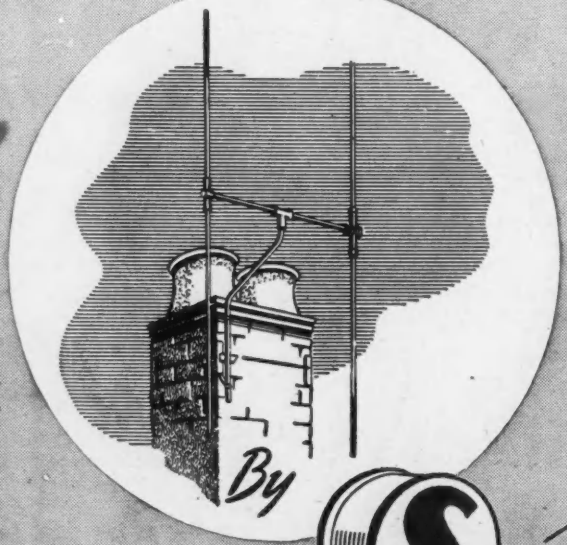

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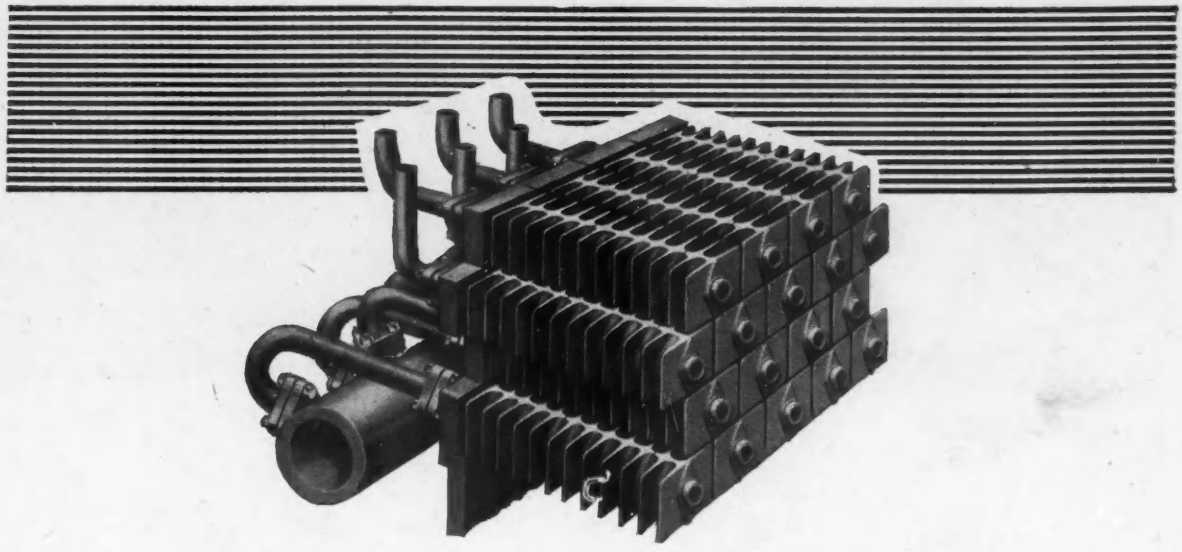

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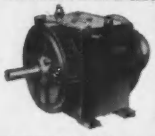
the	BRUSH		Square	Path
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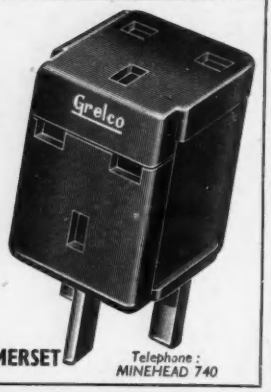

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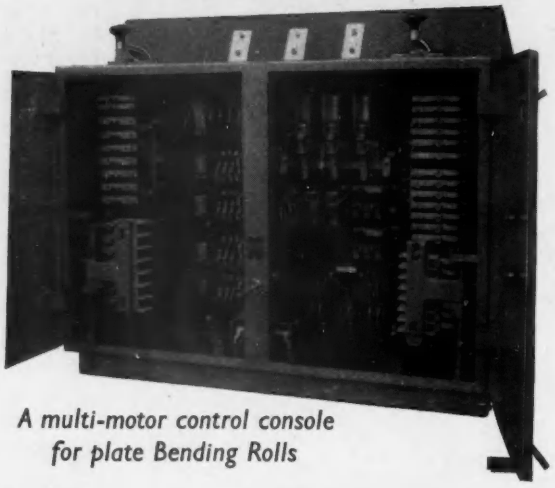

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in

Rye House Power Station

(B.E.A. Eastern Division)

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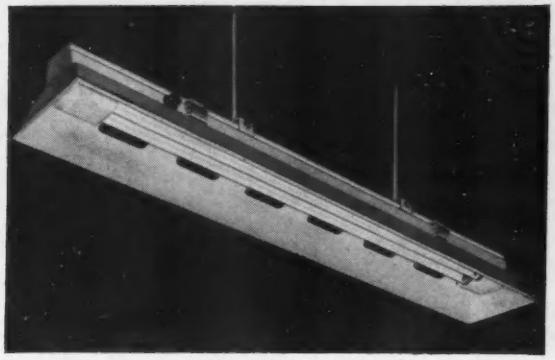
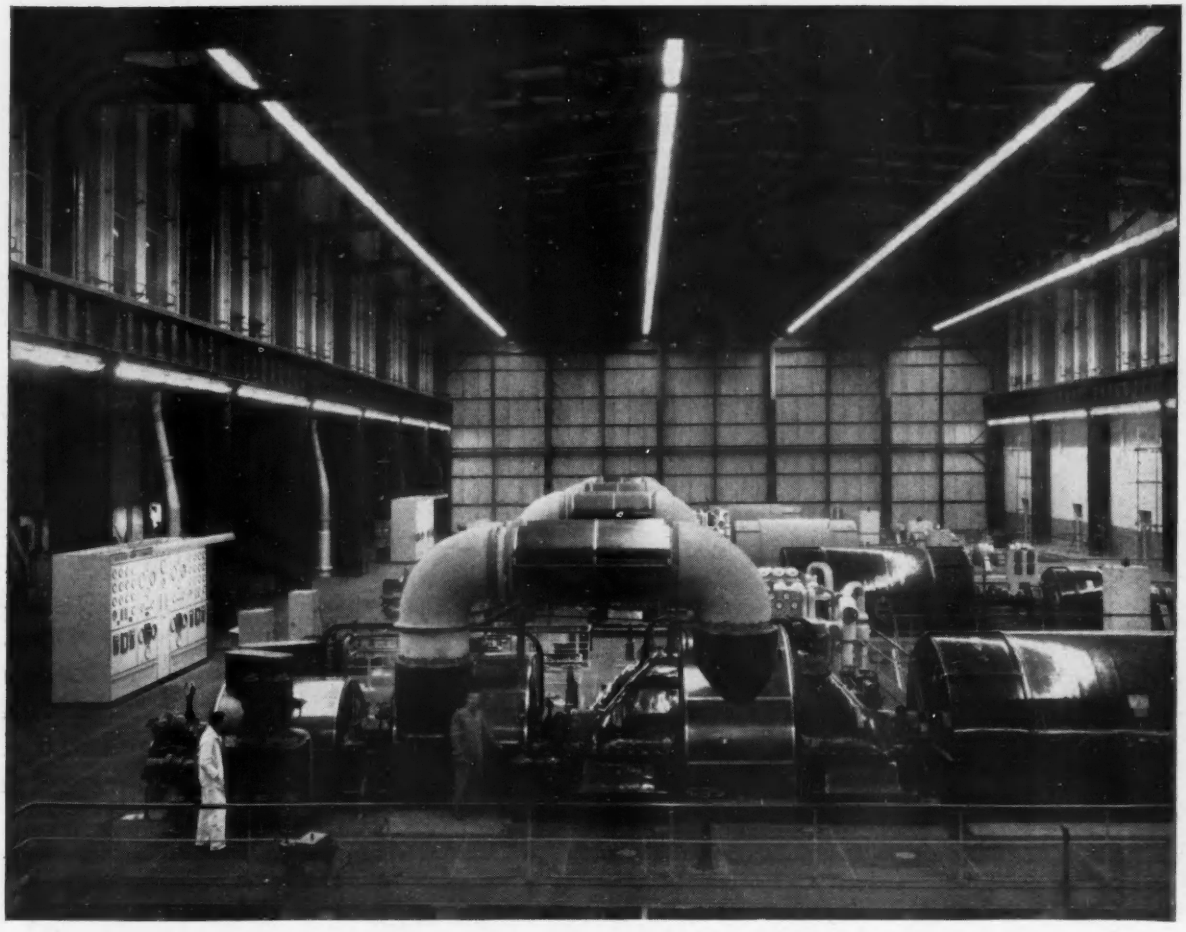


FK series, 80 WATT INDUSTRIAL REFLECTORS:— Closed end trough fittings, housing one or two 5 ft. 80 watt tubes. The reflector is suspended from the chassis by hinges on one side and spring clips on the other; it is entirely detachable for cleaning, and slots provide upward lighting. The reflector is "Miracoat" finished, giving protection in damp or corrosive atmosphere. Vitreous enamelled reflectors are also available. Suspension is easily adjustable.



The installation was designed and planned by the Eastern Division of the B.E.A. in consultation with Thorn Electrical Industries, and was carried out by the Hertford District of the Northmet. Sub-Area Eastern Electricity Board.

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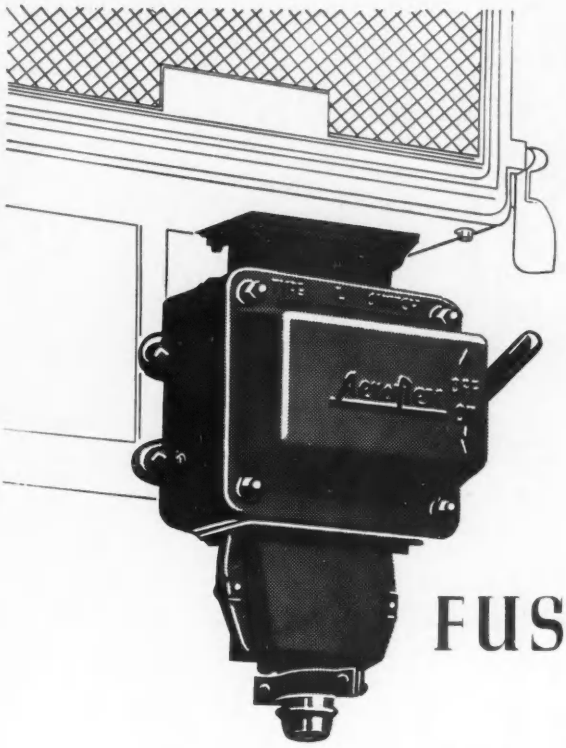

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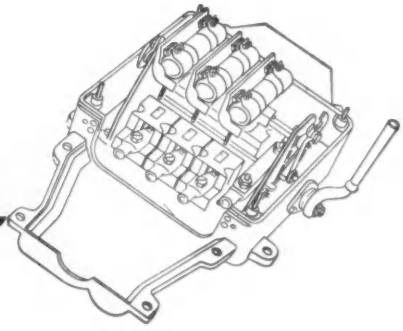

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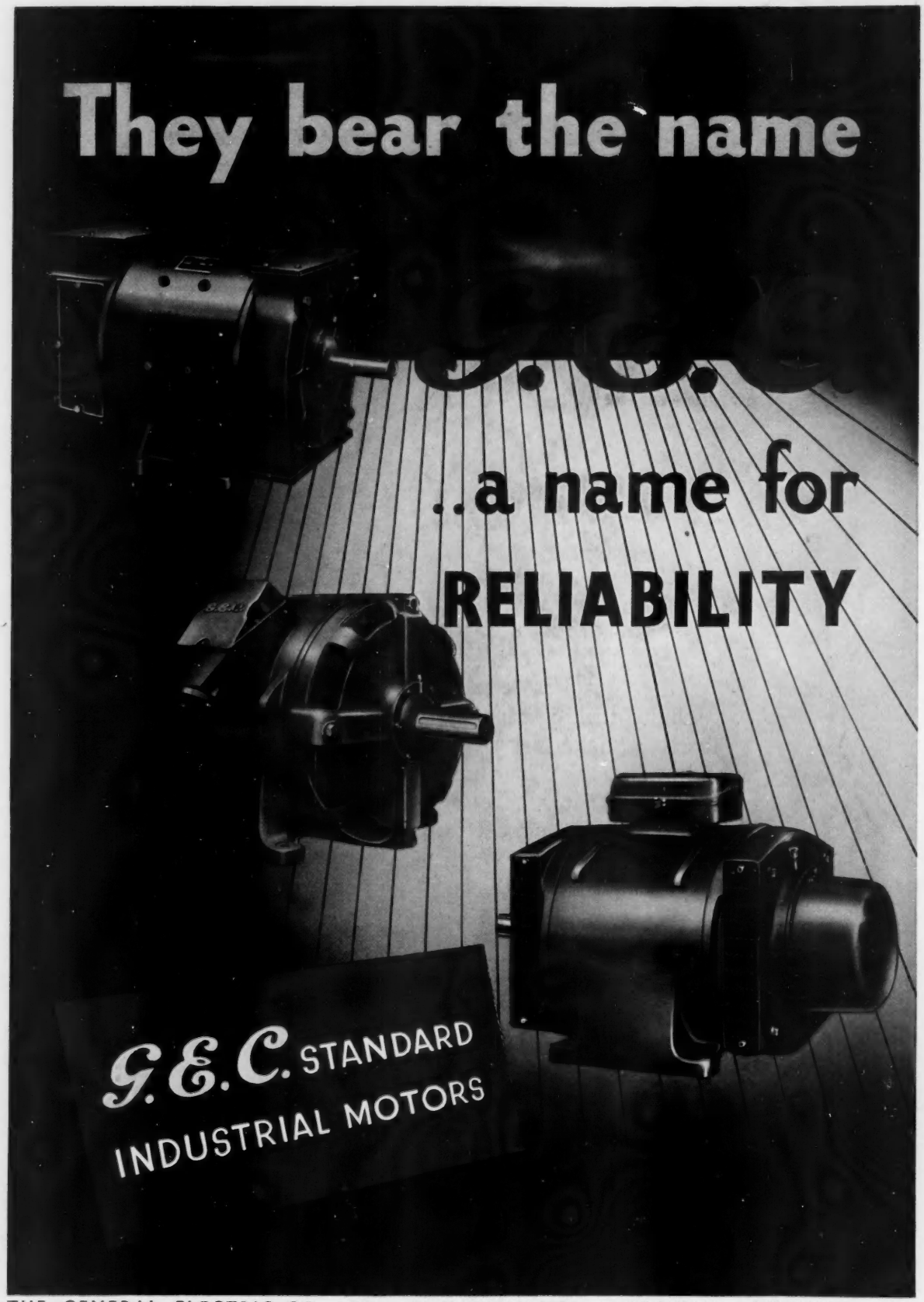

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